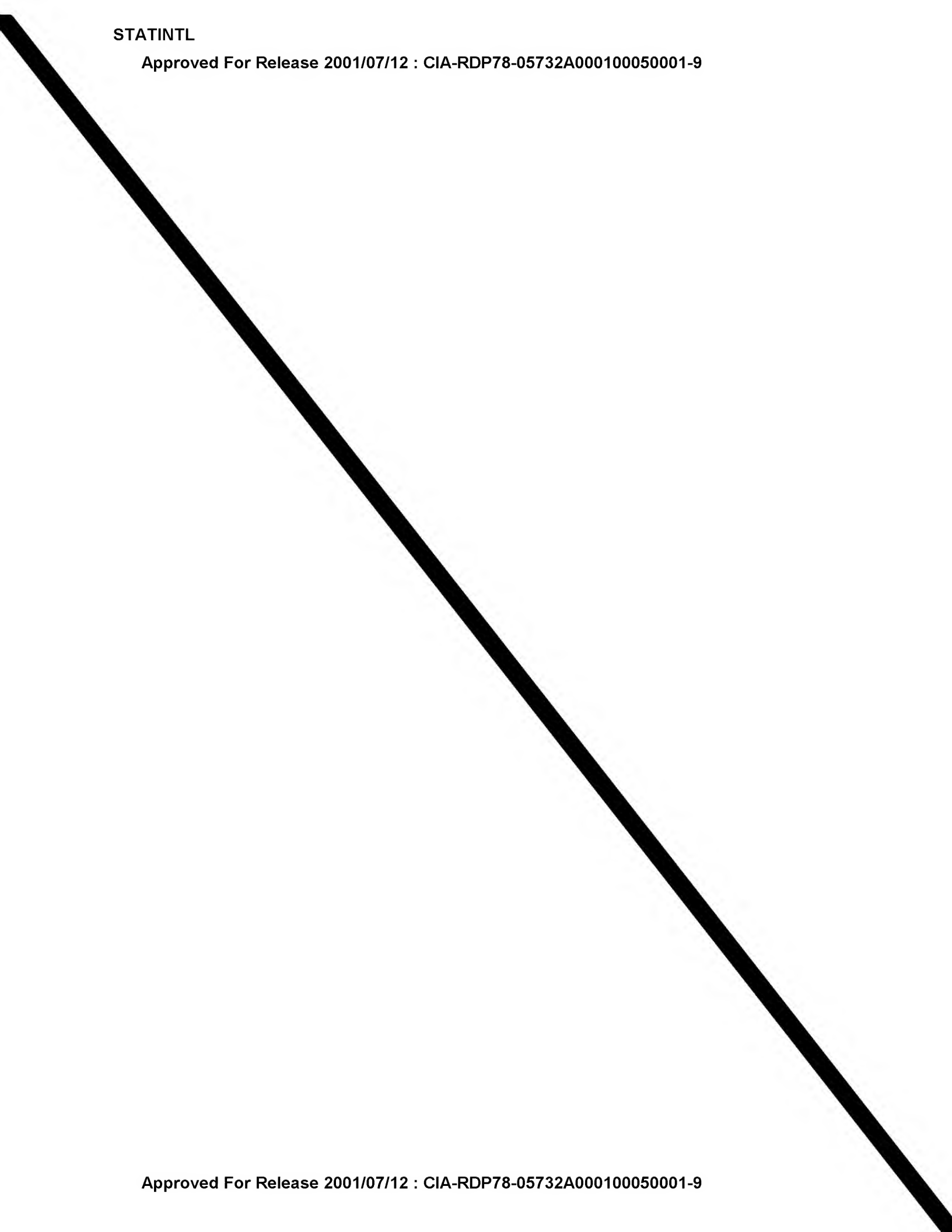

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Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

FORWARD

SCOPE OF PROJECT

The project is identified as follows:

Name: Utilities System Study

STATINTL Location: [redacted]

STATINTL

Project Number: [redacted]

Description:

This report is for the purpose of providing an anlysis of the capacity and reliability of the hereinafter designated utilities systems. It is intended to include only major utility components and distribution therefor

STATINTL within [redacted]

The utilities systems to be included in this analysis and report are (a) Electrical Power (b) Airconditioning (the chilled water systems and the airhandling and distribution systems and the automatic control systems((c) Compressed Air, and (d) the Process Water (Note: There are three systems of processed water. They are cold water (45 degrees), ambient water (70 to 72 degrees), and hot water (145 degrees).

Their analysis shall indicate the total capacities of each system, system loadings, and the excess or deficiency in capacity of each system. The analysis will also concern itself with rates of consumption and when they occur and recommend methods of operation of all systems.

In addition to the above, the report shall include an evaluation of the life expectancy of major functional components of present systems equipment. Include conclusions on spare parts adequacy; for example, seals for the vacuum pumps, etc.

The final report shall include charts, graphs, and recorded data, and all necessary sketches and diagrams required to present a usable management tool for operational planning purposes. All sketches, diagrams, and exhibits submitted shall not be larger than 24" x 36" and capable of being folded into the 8-1/2"x 11" size of the report.

TAB

AIR CONDITIONING

REFRIGERATION

A. DESIGN

The original design called for two 800-ton absorption type chillers using steam from the [redacted] central heating STATINTL system and condenser water from two cooling towers on the roof of the north end of equipment room. Each chiller has a chilled water and a condenser water pump. The condenser water runs in a single supply and return header to the cooling towers. The chilled water runs in a single supply and return header with branch takeoffs to the air handlers.

Flow thru the air handling units cooling coils is regulated by 3-way mixing valves in the return lines from the units.

Chiller No. 1 and 2 chilled water pumps were each designed to deliver 1920 GPM at 75 feet head. Each condenser water pump was designed to deliver 3100 GPM at 85 feet head. Design chilled water flow thru Air Handling Unit 1 was 782 GPM. Design flow thru Air Handling Units 2, 3 and 4 was 774 GPM and thru Air Handling Unit 5 was 565 GPM, with a 10° chilled water temperature rise. The cooling coils are sprayed so that the cold air supply is saturated air.

B. MODIFICATION TO DESIGN

During the six-year occupancy several major changes have been accomplished.

A new 748-ton absorption chiller was installed including an over-sized cooling tower cell. The chilled water pump for chiller No. 3 was designed to deliver 1800 GPM @ 90-foot head. The condenser water pump was designed to deliver 3100 GPM @ 85 ft. head.

The chilled water piping system was modified. A reverse return loop was installed to prevent short cycling of chilled water thru three-way valves into the chiller intake connections.

C. CURRENT CONDITIONS

1. With outdoor conditions of 92°F dry bulb and 73° wet bulb, chiller No. 1 had a flow of 1660 GPM and a 6°F temperature drop. This represents 415 tons of cooling capacity. Chiller No. 2 had a flow of 1600 GPM and 6°F temperature drop. This is 400 tons of cooling capacity. Chiller No. 3 had a flow of 1180 GPM and 7°F temperature drop. This is 342 tons of cooling capacity. This totals 1157 tons.

2. Flow thru the air handling units coils could not be measured as the available flow meter could not be adapted to the orifice connections on the chilled water lines to the air handlers.

3. The head on chiller No. 1 chilled water pump, according to the gages, is 79 feet. On the chilled water pump for chiller No. 2 it is 86 feet, and for chiller No. 3 chilled water pump 67 feet.

4. Condenser water flow from the cooling tower is as follows: Chiller No. 1--2700 GPM at 102 feet head; Chiller No. 2 2-3000 GPM at 106 feet head. Chiller No. 3-1760 GPM pressure gage was inoperable.

5. The 3-way valves controlling the chilled water to the air handlers are operated from the control room. All are kept at full-open position during the summer months.

6. The following are the maximum and minimum temperatures of the main supply cold air duct from the air handling units for a certain time period. Also, the maximum and minimum outside air temperatures for the same time period.

Air Handling Unit No.	Cold Duct Min.	Cold Duct Max.	Outside Air Min.	Outside Air Max.	Time Period
1	54.6°	56.5°	76.2°	86.6°	21 hrs.
2	53.8°	55.8°	76.8°	86.6°	21 hrs.
3	55.0°	58.0°	76.0°	91.8°	22 hrs.
4	61.5°	63.0°	88.5°	93.2°	6 hrs.
5	61.5°	66.9°	82.5°	97.5°	23 hrs.

(See Appendix A for Sample Charts.)

7. The entering and leaving chilled water temperatures to the air handling units coils are as follows:

Air Handling Unit	Water In	Water Out
1	42°	50°
2	42°	*
3	42°	48°
4	42°	*
5	42°	52°

* No Thermometer

Combining these with the air flow readings gives the total load on the coil at conditions. Using these total loads and the readings of the chilled water temperature rise thru the air handling units coils, the flow of chilled water can then be calculated.

Air Handling Unit No.	Total Load BTUH	Chilled Water Temp Rise Thru Coil	Flow GPM
1	5,120,000	8°	1275
2	2,560,000	6°*	855
3	2,180,000	6°	725
4	2,570,000	6°*	855
5	2,840,000	10°	565
		TOTAL GPM	4275

*Assumed-thermometer missing but return to chillers averaged 6+ degrees rise.

The flow thru the chilled water coil of air handling units No. 1 is 60% more than its original design capacity, air handling units No. 2 and No. 4 are 10% in excess, air handling Unit No. 3 is 10% less than capacity and air handling Unit No. 5's chilled water flow is at design capacity. Only the cooling coil of air handling Unit No. 5 is operating at design capacity; however, the leaving air temperature of 66.5°F drybulb is 12.5° above design due to the high percentage of outside air.

D. OBSERVATIONS

1. The chilled water system is operating at only 50% of its design capacity.

2. There is no temperature control of the system from the equipment room. The control panel does not give accurate readings of the cold supply air temperature or of the cutside air temperature therefore the 3-way valves controlling the chilled water to the air handling units are maintained at full-open position.

3. There is little that can be done to the existing chilled water system to supply more cool air to the building. The quantity of chilled water now being supplied to the air handling units is 17% greater than the original design flow, yet the load on the coils is 17% less than the original design load. The main problem is the high temperature of the air entering the coil caused by the high percentages of outside air as

discussed in the "Air Balance" section of this report. The higher the entering air temperature the greater the bypassed air load and higher the temperature of the cooled air leaving the coil. These combine to give a higher cold supply air temperature.

4. The flow and head on the pump manufacturer's curves for the chilled water pumps indicates that the flow and head for chiller No. 2 follow the curve characteristics, while for chiller No. 1 either the flow or the head are in error, the probability being that the head is about 3 or 4 ft. greater than indicated. However, the flow and/or head readings for chiller No. 3's chilled water pump are very much in error. At the flow indicated, the head on the pump would have to be about 100 ft. and at the head indicated the flow would 2050 GPM.

5. Readings indicate that the building return air is approximately 81°F dry bulb when the outside air is 95°F dry bulb. Readings taken at various return air dry bulb temperatures indicate a consistent relative humidity of approximately 50%. Using mixture temperatures, the percentages of outside air being mixed with return air at the relief dampers and at the air handling unit plenum can be calculated. Taking the outside air design temperatures of 95°F dry bulb and 78°F wet bulb and locating this and the mixture points on a psychrometic chart (See Psychrometic Chart I thru V in Appendix B), together with the rise thru the air handling unit, we can determine the entering conditions of the cooling coil. The leaving conditions of the air from the coil

can be had from the main cold duct temperature readings which are known to be near saturation.

E. CONCLUSION AND RECOMMENDATIONS

The chilled water system is operating at less than full flow because there appears to be more head in the system now than the original design. This could possibly be the result of the installation of a reverse return chilled water loop that added some 200 lineal feet of piping and its attendant friction loss. We are not getting full capacity from the chiller because of reduced flow.

We recommend the alterations to the chilled water piping and/or pumps to bring the system up to the original design flow of the chillers.

AIR CONDITIONING

AIR BALANCE

A. DESIGN

The air system serving the building consists of five built-up air handlers, designed to ultimately supply a total of 427,000 CFM. The original design called for a maximum of 90% of the supply air to be returned from the building to the air handlers, the remainder being made-up from outside air.

The air is returned to the air handlers by eight 40,000 CFM return fans which discharge into a common return plenum and one 85,000 CFM return fan (No. 21) originally designed to discharge directly into the return plenum of air handling unit No. 5 or exhaust according to outside air conditions. This is a total of 405,000 CFM. The outside air intakes of all five air handlers have modulating motorized dampers operating in conjunction with dampers on the return air intakes to the air handlers. These dampers can modulate to 100% outside air when the outside air temperature warrants. The main return air plenum has modulating motorized relief dampers operating in conjunction with the outside air-return dampers.

The air not returned to the air handlers is exhausted from the building thru locker room toilet and kitchen areas for the most part by exhaust fans. Total exhaust was originally designed for 43500 CFM.

In addition to the five large-capacity air handlers there are three smaller air handlers designated AHU-2E, AHU-4SE, and AHU-2G. Combined they were designed to ultimately deliver 40,000 CFM and return 35,400 CFM of that air, the remainder made up by outside air.

In summary, the original ultimate design of the building was to receive 467,000 CFM of conditioned air, with a total return air of 440,400 CFM and an exhaust system of 53,400 CFM. This would leave the building under a negative pressure, the deficiency being 26,800 CFM.

B. MODIFICATIONS TO DESIGN

Air handling units nos. 2, 3, & 4 were originally installed with sheaves that reduced their capacities to 55,000 CFM, 52,000 CFM and 54,000 CFM respectively.

Return air fan No. 21 serving air handling unit No. 5 exclusively was revised to exhaust all it's air regardless of outside air conditions. There is no record of changing the capacities of the eight 40,000 CFM return fans. The modifications above would result in the following conditions:

Supply to building = 371,000 CFM

Return from building = 355,400 CFM

Exhaust from building = 141,400 CFM

The negative pressure of the building would thus be greatly increased, the deficiency increasing to 125,800 CFM.

It is difficult to imagine a structure with so few windows under this great an air imbalance; it may be that we do not have access to all the modifications performed during the period of occupancy.

C. CURRENT CONDITIONS

The five built-up air handling units are currently delivering 266,000 CFMS of conditioned air to the building which is approximately 80% of the installed capacity.

The eight return-air fans are returning a combined total of 80,000 CFM which is only 25% of the design capacity. The exhaust fans are exhausting a total of 108,000 CFM which is approximately 75% of the installed capacity.

Excluding the smaller air handling units, the building now has a positive pressure, the excess amounting to 78,000 CFM.

D. OBSERVATIONS

1. Air-handling Units Nos. 3,4, & 5 total static pressures exceed ultimate design static pressures. At the same time the fan RPM of these units was close to design while the actual horsepowers were 60% to 80% of their ultimate design maximum horsepower.

2. Air-handling Unit No. 1 is operating at its design static pressure and design RPM but it's horsepower is 80% of design.

3. Air-handling Unit No. 2 is operating at 75% of ultimate design static pressure and 80% of ultimate design from RPM and 50% of ultimate design horsepower.

4. Return air fans No.s 15 & 19 are not being operated due to complaints of excessive noise and vibration in certain spaces in the building.

5. Return air fans Nos. 13, 14, 16, 17 & 18 static pressures exceed design by 17% to 33% while fan RPM are at design and horsepowers are 50% to 70% of design.

6. Return fan No. 20 static pressure exceeds design by 20% while fan RPM is 95% of design and horsepower is 60% of design.

7. All modulating dampers are inoperable. Return air dampers are in the full open position. Outside air dampers are all approximately 30% open. Relief dampers are in full closed position.

8. All return fans, with the exception of No. 16, have negative static pressure readings at the fan discharge and No. 16 is only +.06". All return fans have a negative static pressure at the fan inlet which is in excess of the design static pressure. This condition was corrected when the boxes were cleaned.

E. CONCLUSIONS & RECOMMENDATIONS

1. The return air fans appear to be a major cause of air imbalance which can cause insufficient cooling, and inefficient heating.

2. Return fans are the major source of noise and vibration. The noise problem appears in the ductwork above certain spaces in the building. This should be investigated and corrected.

3. All return fans are operating at higher than design static pressures. As the static pressures at the fan inlets already exceed design, and there is only a short run of straight duct between the fan inlet and the point where the duct leaves the building, the problem must be within

the building. Dirt-clogged return-air boxes were one of the main problems. These boxes have been cleaned. The velocity and static pressure readings taken before the boxes were cleaned (July readings) and the readings taken after the cleaning (September readings) are shown in Appendix D.

4. Considering that the air handling units are not operating at ultimate capacity, the pressure drops of the air thru the spray chamber, the eliminators and the cooling coil sections appear high. The coil face velocities are 400 FPM or less and all were designed for 500 FPM. At 500 FPM pressure drops thru the section should not exceed one inch while readings indicate drops of 2-1/2 to 5 inches. These areas were not checked for physical conditions because inspection would have required unit shutdown. It appears the coils are in need of cleaning and repair.

AIR CONDITIONING

HEATING SYSTEM

A. DESIGN

STATINTL High pressure steam from the [redacted] central system is fed to pressure reducing stations. Low pressure steam (5 psi) from the reducing stations serve the preheat and reheat coils of each air handling unit. Two preheat coils for each air handling unit are installed one behind the other. The first preheat coil is designed to heat the mixture of return and outside air from 0°F to 40°F and the second preheat coil is designed to heat this air from 40°F to 80°F. These coils function during the winter months only.

The reheat coil for each air handling unit is located in the main hot air duct downstream of the cooling coil and is designed to heat a varying amount of air from 40°F to 85°F. This coil receives part of the air leaving the cooling coil and must operate on a year-round basis.

B. MODIFICATION - NONE RECORDED

C. CURRENT CONDITIONS & OBSERVATIONS

Only the reheat coils of the air handling units were functioning during the period when these observations were taken. There are many leaks in the low pressure steam piping in the equipment room. This is the major source of water damage to the insulation and for the large areas of water on the floor. The following are the main hot duct temperatures when the outside air is at design summer conditions of 95°FDB and 78°FWB. The original hot duct design air temperature was 85°F:

Air Handling Unit No.	Hot Duct Temperature (°F).	Temperature Rise Across Reheat Coil (°F)
1	81.0	24.0
2	74.5	18.0
3	101.0	43.5
4	62.5	0.0
5	90.0	23.5

The percentages of hot supply air to the total supply range from 28% to 55%.

D. CONCLUSIONS AND RECOMMENDATIONS

1. The reheat coil on air handling Unit No. 4 is obviously not functioning. With the supply air temperature being as high as it is the space served has probably not experienced any uncomfortably cool conditions.

2. The large percentage of hot air being supplied to the building would seem to indicate that the quantities of cold air are more than sufficient. There is also the possiblity that the mixing boxes in the building are not functioning or that the hot side of the mixing boxes leak profusely. The situation should be investigated and if the mixing boxes are at fault the quickest and most economical way to increase the cooling capacity would be to lower the set point temperatures on the hot decks to about 70%F.

3. There were no preheat coil readings taken because all readings

were taken during the cooling season. Preheat coil readings would not be very meaningful in that the coils are sized for 100% outside air and this operational position is impossible to obtain with the control in their current condition.

AIR CONDITIONING

CONTROLS

A. DESIGN

The equipment in the equipment room is monitored and in part controlled from a central control panel housed in a room overlooking the equipment room. It is manned around the clock.

The panel includes indicators for chilled water and, (1) condenser water flow; (2) miniature START-STOP pushbutton stations and indicators for the pumps, air handlers, and various fans; (3) central temperature and humidity-indicating equipment to indicate temperature variation outside control limits for the air handlers, outdoor conditions, and selected spaces within the building; (4) remote temperature adjusters for the air handlers and the process water temperatures, (5) manually-reset alarms and silencing devices to indicate equipment shutdowns or dangerous temperatures, humidities or "no-flow" for process water lines, outside air conditions, roll filter runouts, and selected spaces in the building.

B. CURRENT CONDITIONS

Indicating instruments are out of calibration.

Indicator lights on many of the START-STOP pushbutton stations on the panel are not functioning.

C. CONCLUSIONS & RECOMMENDATIONS

The control panel does not accurately indicate that any piece of equipment is operating and if it is operating whether or not it is functioning properly.

It is recommended that all control equipment connected to the central control panel be checked, cleaned, calibrated, replaced, or repaired, and that this work be immediately performed by the manufacturer of the installed controls.

TAB

PROCESS WATER SYSTEMS

A. DESIGN

The original design called for a de-ionized water system and a filter water system. Each system supplied three water temperatures: cold (45°F), ambient (68°F), and hot (145°F).

Filtered System - Hot - Original design called for a steam-to-water heat exchanger to heat 44 GPM from 60°F to 145°F using 1900 lbs/hr of 5 psi steam.

Filtered System - Cold - Original design called for a water-to-water heat exchanger to cool 83 GPM of city water to 45°F using 35°F brine solution from a separate process water chiller. This chiller was not installed.

De-ionized System - Hot - Original design called for a steam-to-water heat exchanger to heat 28 GPM from 60°F, to 145°F. using 1200 lbs/hr. of 5 psi steam.

De-ionized System - Cold - Original design called for a water-to-water heat exchanger to cool 95 GPM of city water to 45°F. using 35°F. brine solution from a separate process water chiller. See "Filtered System-Cold" for actual chiller installed.

Both the filtered and de-ionized ambient water temperatures are maintained by thermostatically-controlled mixing valves.

B. MODIFICATION TO DESIGN

The de-ionizing equipment was abandoned in place leaving two systems of filtered water. In order to differentiate between the two systems, we shall continue to refer to the original de-ionized system as "de-ionized water".

A 125-ton chiller was installed to supply 146 GPM of 45°F. water with the water entering the chiller at 65°F. The process-chilled water pump was designed and installed for 265 GPM. The head varies because the use of these systems was sporadic, circulating return lines and pumps were installed on the cold and hot lines of both systems.

C. CURRENT CONDITIONS

Examination of Charts XI A & B in Appendix E show almost constant unchanging flow.

Examination of Charts V thru X in Appendix E show the temperatures of the return circulating lines for the process cold water much higher than when they leave the heat exchanger. Similarly the temperatures of the return circulating lines for the process hot water are much lower than when they leave the heat exchanger. The process ambient lines temperatures are too low.

The process water chiller also serves air handler 2E when the building system chilled water temperature rises too high.

D. CONCLUSIONS & RECOMMENDATIONS

1. The high cold water and low hot water return temperatures indicate crossover connections of the two systems within the building. This must be corrected before the working capacities of the heat exchangers can be determined.

2. The ambient lines can be balanced to give the design temperature of 68°F. This would also send more cold water to the 45°F. systems.

3. The almost constant unchanging flow shown on the Flow Meter Chart indicates that the taps in the building are left running constantly. There is no need for this as the hot and cold lines have recirculating lines with pumps.

4. The dilution facility will need further study after the cross-over problem is solved. At the present time the dilution tanks are acting as reservoirs only because of the excess water passing thru the system.

PART II

COMPRESSED AIR

A. DESIGN

The original design called for three separate pneumatic systems:

1. Control Air for temperature control system
2. Process Air for building distribution system
3. Compressed Air for pneumatic tanks to supply pressure for fire fighting sprinkler system.

Control Air System - The original design called for two separate compressors with storage tanks that are headered.

Process Air - The original design called for two separate units that are manifolded to feed a distribution header for various uses in the building.

Pneumatic Pressure Tanks - To supply pressure in the sprinkler fire protection system are supplied air from two compressors that are manifolded.

B. MODIFICATION TO DESIGN

The installations are substantially as designed. Two compressors have been replaced due to ware (wear) and alternators were installed on the two control air compressors and two process air compressors.

C. CURRENT CONDITIONS

The systems operate the intervals indicated in Appendix D.

D. OBSERVATIONS

1. The compressed air systems are operating satisfactorily and appear to meet the building needs. This conclusion is drawn from

the appareant maximum 25% operation that was observed on several occasions at the site during normal working hours. Accepted design practice in compressed air system design allows a 50% operational time.

E. CONCLUSIONS AND RECOMMENDATIONS

The compressed air systems in this building require a maintenance program for equipment that operates around the clock. The compressed air systems should be tied together thru pressure reducing valves for emergency cross-over operation should any compressor fail and be off line for an extended length of time.

TAB

ELECTRICAL

A. GENERAL SYSTEM DESCRIPTION

(1) Electric power is supplied to this facility by three (3) 13.2 KV primary feeders through metalclad switchgear equipment containing air circuit breakers. These primary feeders have been newly reworked and modified by the power company.

(2) Distribution of the primary power is by means of 15 KV interlocked armored cable in open ladder racks to three (3) banks of three (3) 750 KVA network type transformers. Each primary feeder supplies one transformer in each bank for one future transformer.

(3) Each transformer in the system is rated 750 KVA, 13.2 KV Delta to 277/480-volts WYE. Each is equipped with a 1200- ampere indoor type network protector.

(4) Three banks of transformers each form a spot network system feeding a 480-volt draw-out switchboard for local distribution. The connection between transformers and switchboards is by means of 1200-ampere, 3-phase, 4-wire enclosed ventilated bus duct. There are no main circuit breakers on any of the switchboards. The neutral of each transformer is brought out and connected to the low voltage switchboards.

(5) The switchboards are designated as follows:

(a) Switchboard Number 1. - North End

(b) Switchboard Number 2. - Center

(c) Switchboard Number 3. - South End

(6) Switchboard Number 1 has three electrically operated air circuit breakers and serves:

(a) Motor control center number 1, with a 1200-ampere, 3-phase, 3-wire enclosed ventilated bus duct.

(b) North end lighting riser with a 1200-ampere, 3-phase 4-wire totally enclosed bus duct.

(c) North end power riser with a 800-ampere, 3-wire totally enclosed bus duct.

(7) Switchboard Number 2 has three electrically operated air circuit breakers and serves:

(a) Motor control center number 2 with a 1200-ampere, 3-phase, 3-wire enclosed ventilated bus.

(b) Two power risers for the building center each with a 800-ampere, 3-phase, 3-wire totally enclosed bus duct.

(8) Switchboard Number 3 has four (4) air circuit breakers three electrically operated and one manually operated air circuit breakers and serves:

(a) South end lighting riser with 1200-ampere, 3-phase, 4-wire totally enclosed bus duct.

(b) South end power riser with a 800-ampere, 3-phase, 3-wire totally enclosed bus duct.

(c) Motor control center Number 3 with a 1200-ampere, 3-phase, 3-wire enclosed ventilated bus duct.

(d) Motor control center 3a (added later) with a cable feeder consisting of 2 parallel legs of 500 mcm per phase. (See one line diagram).

(9) In addition to this 480-volt distribution system, certain loads in the facility are served from a 208/120 volt switchboard supplied by a 2300 volt feeder, which was the original equipment in the building. This low voltage substation also serves loads in building 216. Certain loads presently being served by this switchboard are being transferred to Substation No. 2 under other modification contracts now in progress.

C. OPERATION AND CONDITION:

(1) During our investigation, certain repairs to the 13.8 KV primary incoming service were being made. One primary feeder was not in service. This condition made one transformer in each bank dead. The facility was operating with only 2/3 of its transformer capacity available. It is now totally in service. The adequacy of the primary system is obvious.

(2) During the time of our investigations a contractor was installing bus insulation in all of the secondary 480 volt switchboards by means of taping and spraying.

II METHOD OF PROCEDURE:

A. Data Desired:

(1) Since it was determined that the primary distribution system and transformer banks could carry the entire facility on 2/3 of capacity for an indefinite period there is no question of overall adequacy, therefore tests were limited to determinations of secondary distribution usage. The primary relays had recently been recalibrated.

(2) We are to determine if each secondary feeder is carrying its share of the total load. The following data was collected for each outgoing secondary feeder at the low voltage circuit breaker load bus:

(a) Kilowatts of power.

(b) Amperes of current flowing.

(c) Phase voltage.

All readings were taken continuously over a 72 hour period of a normal working week by means of recording instruments. Measurement periods started and ended at midnight between Monday and Friday. The 72 hour of continuous measurement in our opinion, permits enough time for all normal operations within the facility to occur at least once. An operation which does not start or end at least once every 72 hours of working time will not be a significant normal operating function.

B. Data Collection:

(1) Each outgoing feeder from the 480 volt secondary switchboards was metered separately one at a time for 72 hours.

(2) The meter charts were collected and analyzed for power consumption (maximum current flow compared to rating). Fluctuations in current, voltage and power were noted and analyzed and the power factor computed from the meter readings.

(a) Power factor is computed by the following method.

$P = 3 E I \cos \phi$

$\cos \phi = P/3EI$

P. = KW from meter

E = Voltage from meter

I = Current (high phase) from meter computed at max. and min. loading.

(3) An independant testing company was retained to furnish, install and read current transformers and meters on the feeders. They also furnished preliminary analysis of meter charts to screen extraneous information. This testing company also made repairs to the switchboard bus insulation required due to damage incurred in the installation and removal of instrument transformers. The foregoing was done under supervision.

C. Results

(1) All 480 volt secondary feeders have been measured.

(2) Examination of the test results indicate light loads on all building power risers which would indicate that overloading problems reported at certain points within the facility are internal distribution problems, local in nature. The solution to such problems would require investigation at the site of the trouble.

(3) Test results for power feeders for a 72 hour period are as follows:

(A) Switchboard Number 1 Power Riser

(a) Normal working hour loading

ie Pick up at 7:30 am

Drop off at 4:30 pm

Peak loading 1:20 pm approximately 50 amperes

See appendix tilted 480 volt feeder load characteristics.

(b) This load is characterized by voltage fluctuation from 475 to 460 volts. The voltage is pulled down at starting time ie 8:00 am

(c) The peak load on the feeder was approximately 20% of rated capacity.

(B) Two power risers from swtichboard Number 2 for a 72 hours period indicate:

(a) Normal working hour loading.

ie Pick up at 8:00 am

Drop off at 4:30 pm

(1) Although loading is fairly constant during the day, peak loads occured between 3pm and 4pm each day, but these peaks did not vary appreciably from steady state loading. Minimum loading on these feeders occured at 1:00 am.

(b) Load on riser number 1 is characterized by heavy starting inrush at pick-up time indicating that local power equipment is served.

(c) Peak load on these feeders during the test period did not exceed 20% of their rated capacity. The power was fairly constant at 0.91.

(C) Switchboard Number 3 Power Feeder

(a) Pick up at 7:00 am

Drop off at 3:30 pm

(b) Peak loading 100A 10:10 am

Minimum loading 35A 6:30 pm

Maximum apparant usage about 12-1/2% of capacity.

(D) Lighting and Motor Control Center feeders are more heavily and more uniformly loaded.

(E) The conclusions which may be drawn from the foregoing is that additional power required within the building may be taken from the existing power risers.

III CONCLUSIONS

A. General

(1) Each transformer bank provides 2250 KVA of total capacity at 480 volts ie about 2800 amperes of total capacity.

B. Switchboard Number 1

Power Riser Peak Load 96 KW Pf 0.76

Lighting Riser Peak Load 405 KW Pf 0.96

Motor Control Center Peak Load 352 KW Pf 0.91

Total Peak Load 853 KW

Average power factor 0.88

KVA utilized 970 FVA

Percentage of capacity utilized 970/2250 = 43%

C. Switchboard Number 2

Power Riser #1 Peak Load 80 KW Pf 0.91

Power Riser #2 Peak Load 80 KW Pf 0.91

Motor Control Center Peak Load 484 KW Pf 0.86

Total Peak Load 644 KW

Average Pf 0.9

KVA Utilized 716 KVA

Percentage of capacity 716/2250 = 33%

D. Switchboard Number 3

Power Riser	Peak Load	64 KW	Pf 0.8
Motor Control Center	" "	465 KW	Pf 0.91
Motor Control Center	" "	8 KW	Pf 0.91
Lighting Riser	" "	380 KW	Pf 0.99
	Total Peak Load	917 KW	
	Average Pf	0.9	

KVA utilized 1020 KVA percentage of capacity 1020/2250 = 45.2% (see appendix).

IV OBSERVATIONS

A. Lighting

(1) Overhead lighting in the Utility Building is served from the 280 volt emergency system. (ie Failure of this system puts out all lights in Utility Building).

(2) Battery operated emergency lights are located throughout the Utility Building however, these are served by the 480 volt system.

(3) Failure of the 480 bolt system will light these lights but at that time all overhead lights remain on and the battery lights are unnecessary. (Most of them failed on test therefore they should be tested and repaired or replaced). Failure of the 280 volt emergency system will turn off overhead lights but will not light battery lights. We would suggest reconnecting battery lights to emergency source so that they will function during the time of lighting failure.

B. Emergency System (208V)

(1) The substation serving this system is quite old and therefore we would question its reliability. It serves, in addition to emergency lights and several miscellaneous highly critical areas in the facility loads in other buildings in the area. We would suggest providing one of the following:

1. A new 2300/208/120 volt primary cubicle, transformer and switchboard to serve only the subject facility.
2. Transfer the building loads presently served by this system to switchboard number 2 and divorce the facility from the 2300-volt system.

(a) The transfering of one highly critical building load from this switchboard to 480 volt switchboard No.2 is comtemplated at present.

D. Dust:

(1) The enclosed ventilated bus ducts between transformers and switchboards and between switchboards and motor control control centers run below a grating floor and are subject to dust accumulation and trash dropping through the grating. We suggest replacing these buses with totally enclosed type.

TAB

MAINTENANCE AND SPARE PARTS

A. INITIAL OPERATION

The preventative maintenance (PM) was instituted by the GSA group when the construction modifications were completed. We do not know what specific frequencies were established or are currently being persued as we were unsuccessful in obtaining a copy of the PM guide for this building.

B. MODIFICATIONS TO INITIAL OPERATION

We have no firm statistical data to prove the following, but feel an in depth analysis of repairs and maintenance for the past six years would validate our opinions:

1. The original frequency schedules that were used were probably for a normal government type office building.

2. These schedules have been slowly modified as trouble has appeared because the equipment (fans for instance) never shut down except for maintenance.

3. The PM program is tied directly to funding. Increases in frequency schedules require additional funds.

C. CURRENT CONDITIONS

The GSA group forces have done a miraculous job. They have provided on call service at all hours and for all types of problems even though they have limited personnel, funds and practically no spare parts.

The building is beginning to experience the effects of age (six years plus) and constant use, especially on high speed rotating equipment.

A failure of almost any piece of large equipment or part can cause a curtailment of activities within the building because the time required to find replacement parts and personnel to accomplish the repairs. Sometimes outside subcontractors must be brought in because group forces are too busy and/or spread too thin. They have to maintain several other buildings in the [redacted] as well as STATINTL building.

GSA trains their operational personnel in the maintenance and repair of equipment and subsystems. If these people were to stay for an extended period in one location, this approach would be satisfactory. The attrition of personnel who by virtue of growth in training and experience are granted grade increases and transfers keeps a constant flow of new inexperienced people attempting to operate a complicated system with many intricacies. Unfortunately, by the time they have been thoroughly indoctrinated, they usually are transferred.

The present control system is so out of calibration, and working order that any change or modification to the airconditioning system does not make sense in that we have watch engineers attempting to control with devices that are incapable of controlling. Many are disconnected.

The building refrigeration system has recently been taxed beyond its capability because of the problem of dirty return air that clogged the high velocity return air boxes over a period of six years. This came to light when the return air fans were checked for capacity and static pressure and the return air system was found to be operating at less than 25% of its rated capacity. The buildings operational personnel tried to overcome this problem in various ways, some of which only ultimately served to compound the problem. (They did not run two return air fans at the request of the building tenants because of the noise and vibration on the third floor room was not tolerable).

There is essentially no visible major spare parts program for the building and therefore we are unable to comment except in Conclusions and Recommendations.

There are many recurring problems in the building, such as breaking of fan belts that could be prevented by a more comprehensive preventative maintenance program. The "FSA-PBS Office of Buildings Management Preventative Maintenance Guide" (See Appendix G) provides such a program when properly applied and when faithfully followed. However, the fact that this building is run on a around-the-clock, seven-day-a-week schedule requires that the current frequencies be reviewed and modified.

D. CONCLUSION AND RECOMMENDATIONS

The existing maintenance and spare parts program should be revised. The revision should be based on an in depth survey of the current practices and an analysis of all previous repairs and replacements to date since the building opened.

The analysis should be reviewed by the building tenant and GSA to establish the criteria for outages, shutdowns and overtimes, etc. The funding for spare parts and maintenance should be budgeted in advance on a schedule. The work forces should also be programmed.

Our recommendations for the building would be the reclassification of the building from general to special use so it could have its own maintenance staff on a basis of working only in this building and a complete inventory of vital spare parst.

Both of these items will cost money. The amount of money required, and the spare parts list are beyond the scope of this project.

TAB

SECTION I PART V

SUMMARY

This survey is intended to furnish management with information for planning purposes as to utility growth capability.

The utility systems are capable of a 30% growth within the building provided an adequate PM program is accomplished and further provided that some internal adjustments are also accomplished. The following represents our estimates of the most urgent items in their order of priority.

1. Initiate a further study of utilities within the main building.

Estimated Cost $80,000.00

2. Issue a time and material contract to the [redacted]NTL Company to calibrate, adjust, repair and replace the necessary controls in the utility room.

Estimated Cost $50,000.00

3. Initiate a program of vital stock spare parts.

Estimated Cost $60,000.00

4. The partial recirculating loop in the process water system should be traced and improper conditions corrected.

Estimated Cost $ 5,000.00

5. Replace the existing 208V emergency system.

Estimated Cost $ 3,000.00

Other areas that need attention, but that are difficult if not impossible to attach quantitive cost estimates, are the increase in the PM program by a frequency factor of 2 and maintain the same staff for this building at all times and reduce the attrition and rotation.

The building GSA people have programmed the funding for additional refrigeration capacity in the seventies for this building. We believe that this additional refrigeration capacity is not now necessary in that under corrected operational procedures, any two of the chillers installed should be able to hold building temperatures with its current use factor. The excess outside air that was drawn into the building machinery during the constriction of the return air system amounted to approximately one thousand tons increased airconditioning load that used the entire capacity of all three installed chillers.

Certain major equipment life expectancy must be shortened from normal standards because of the use factor. A pump can normally be expected to last 10 years with only normal seal maintenance. This type life is the result of experience over the years with equipment that operates some 3000 hours per year. This building operates 8700 hours a year and therefore it is our judgement, that all equipment will have a life expectancy of one half of that that might be normally expected.

The remaining life expectancy with normal maintenance that appears in appendix C was calculated in the following manor:

Minimum Depreciation Period (as listed in the 1968 ASHRAE Applications book, chapter 55) divided by a factor of two (for the reason stated above) less seven years that the equipment has been in service.

Example:

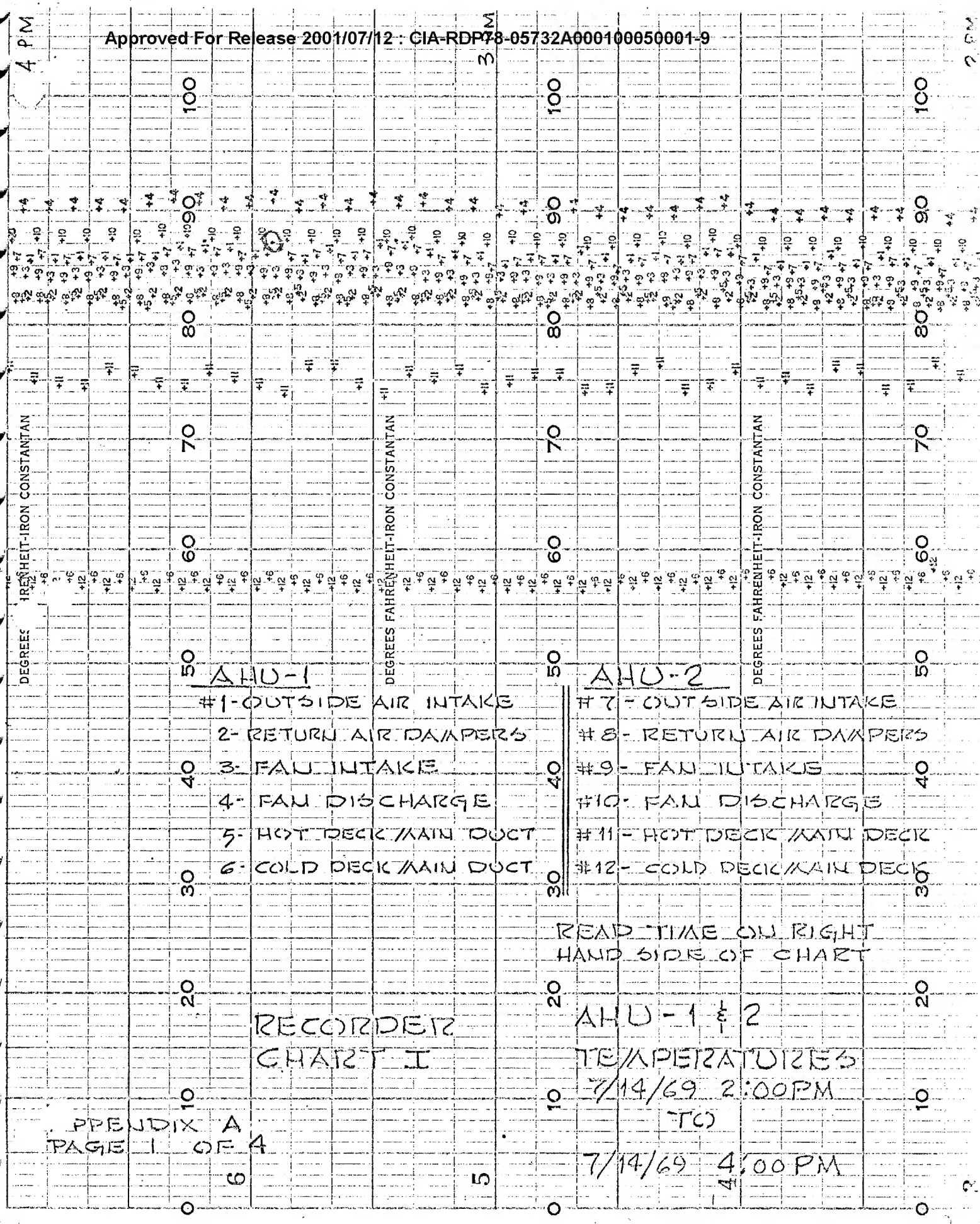
Chilled Water pump -- 20 years minimum depreciation period. Use one half life or 10 years because of continuous operation. Subtract the seven years the system has been running. This leaves three years remaining life expectancy. The pump, motor, bearings and casings will undoubtedly last longer, but repair and maintenance will increase rapidly.

TAB

SECTION 2

APPENDIX A

The temperature charts are only samples of total charts taken during test periods. The locations of the points where temperatures were taken are shown on the drawings in Appendix H.



APPENDIX A
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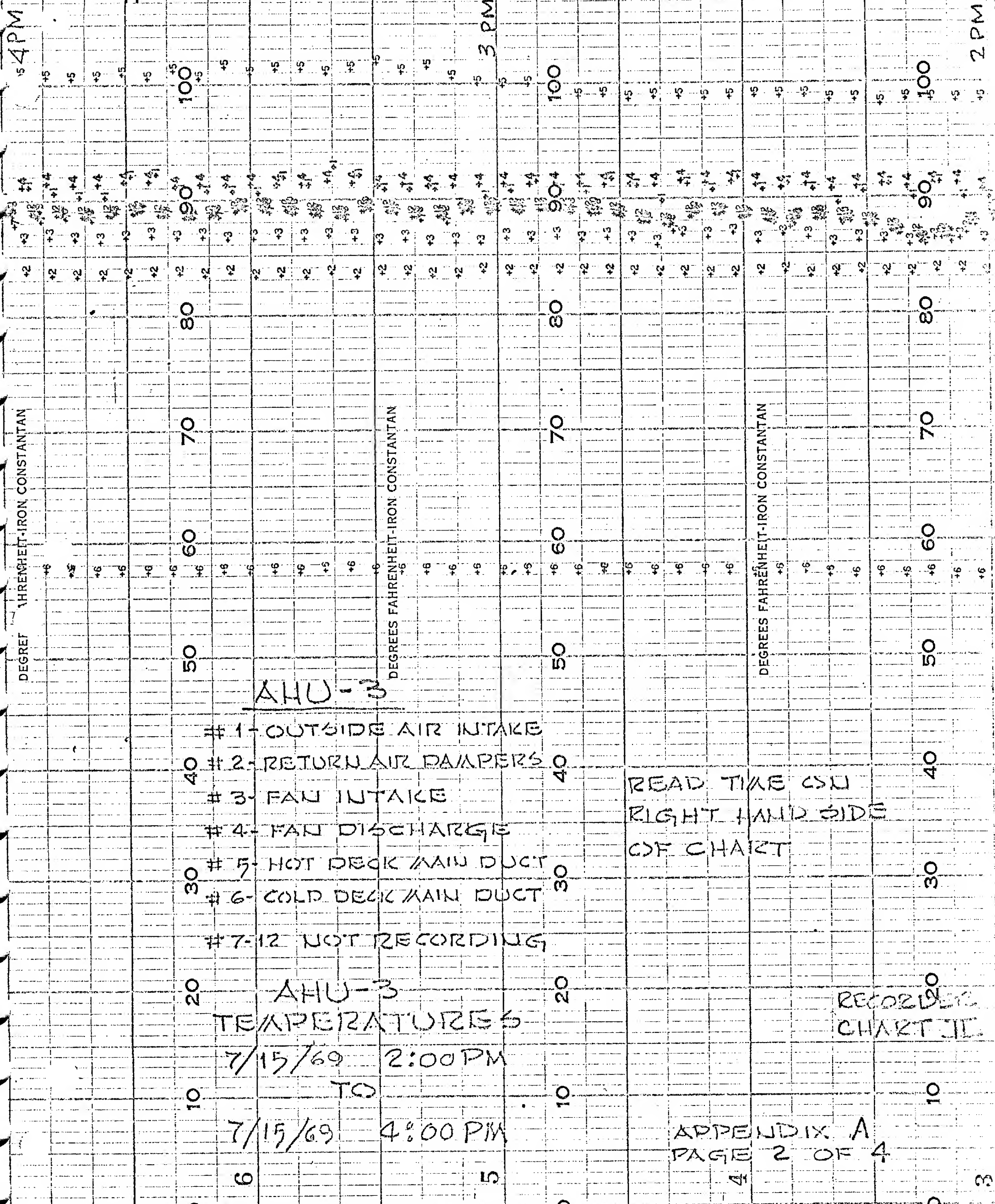
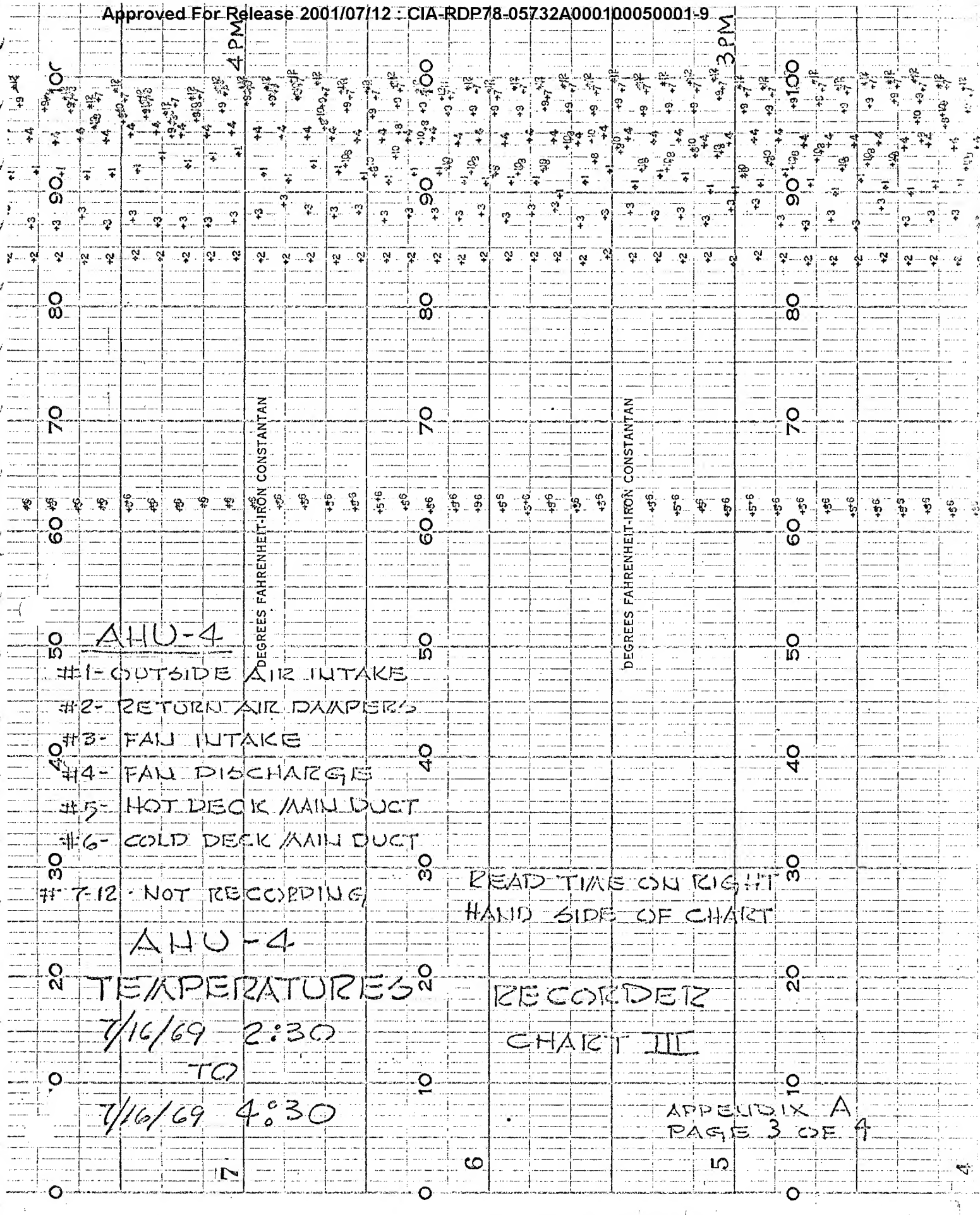
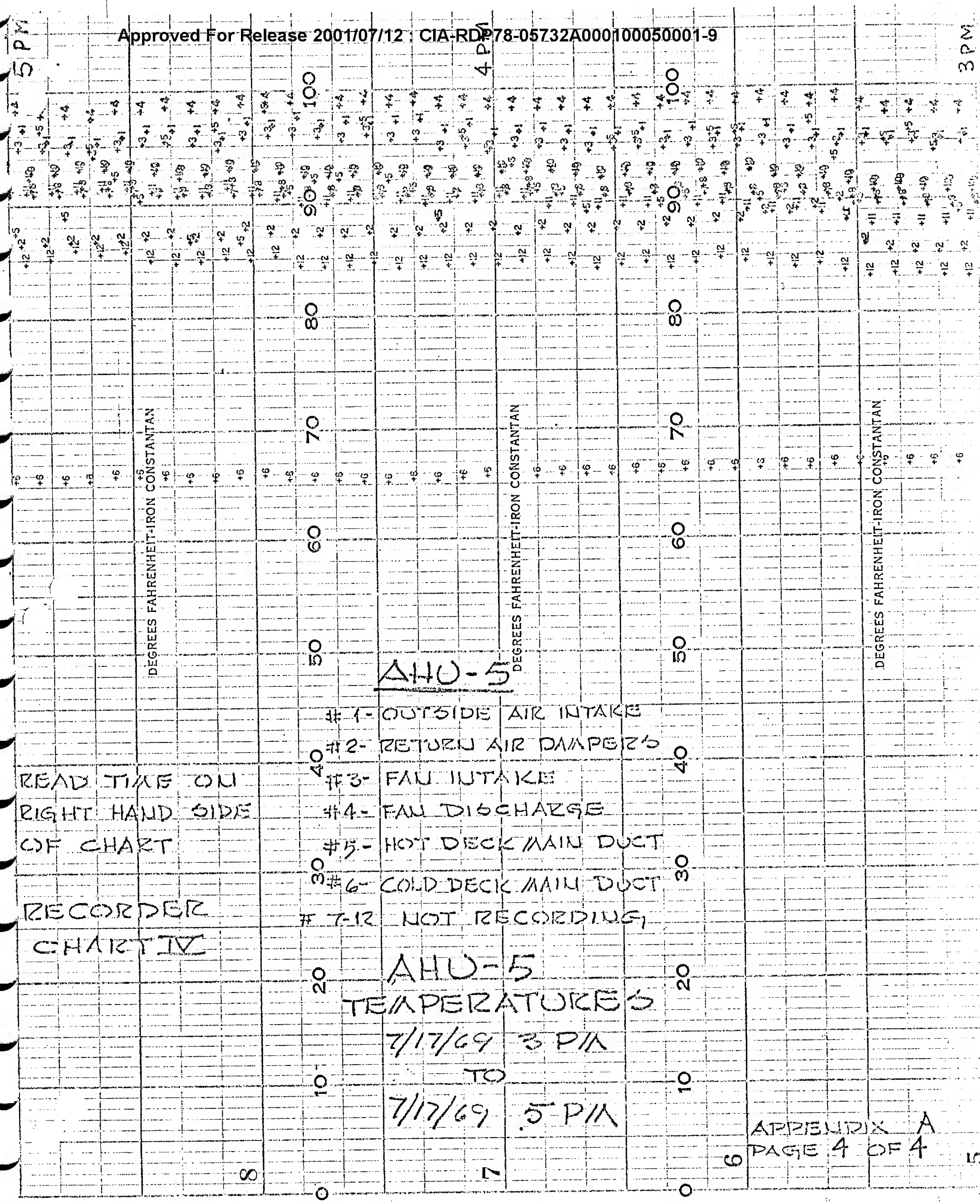




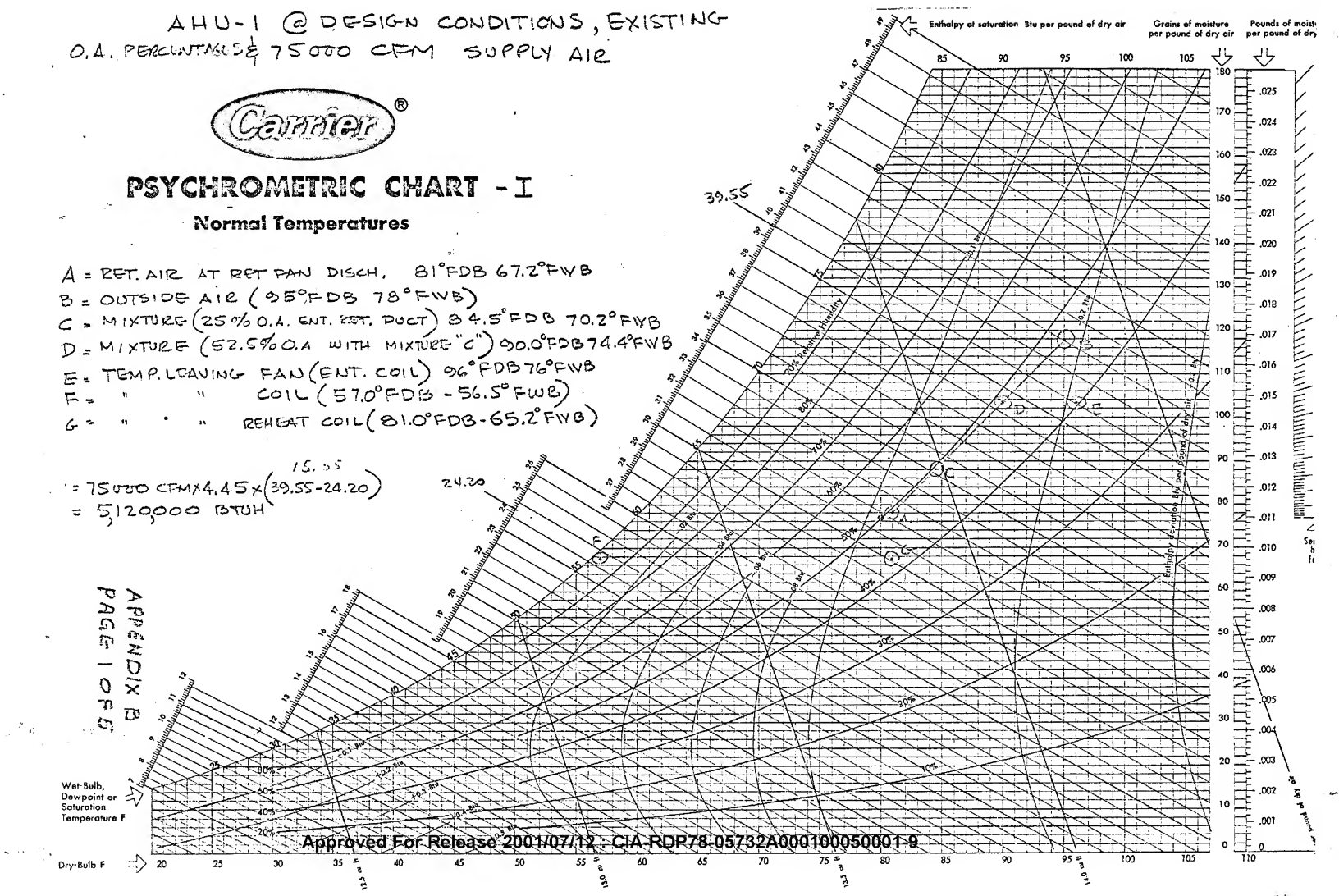


SECTION 2

APPENDIX B

The psychrometric charts in this appendix indicate the various points and conditions the air passes thru in the large air handlers.

AHU-1 @ DESIGN CONDITIONS, EXISTING
O.A. PERCENTAGES & 75000 CFM SUPPLY AIR



= 75000 CFM X 4.45 X (39.55 - 24.20)
= 5,120,000 BTUH

APPENDIX B
PAGE 1 OF 6

AHU-2 @ DESIGN CONDITIONS, EXISTING
OA. PERCENTAGES & 40600 CFM

Carrier®

PSYCHROMETRIC CHART -II

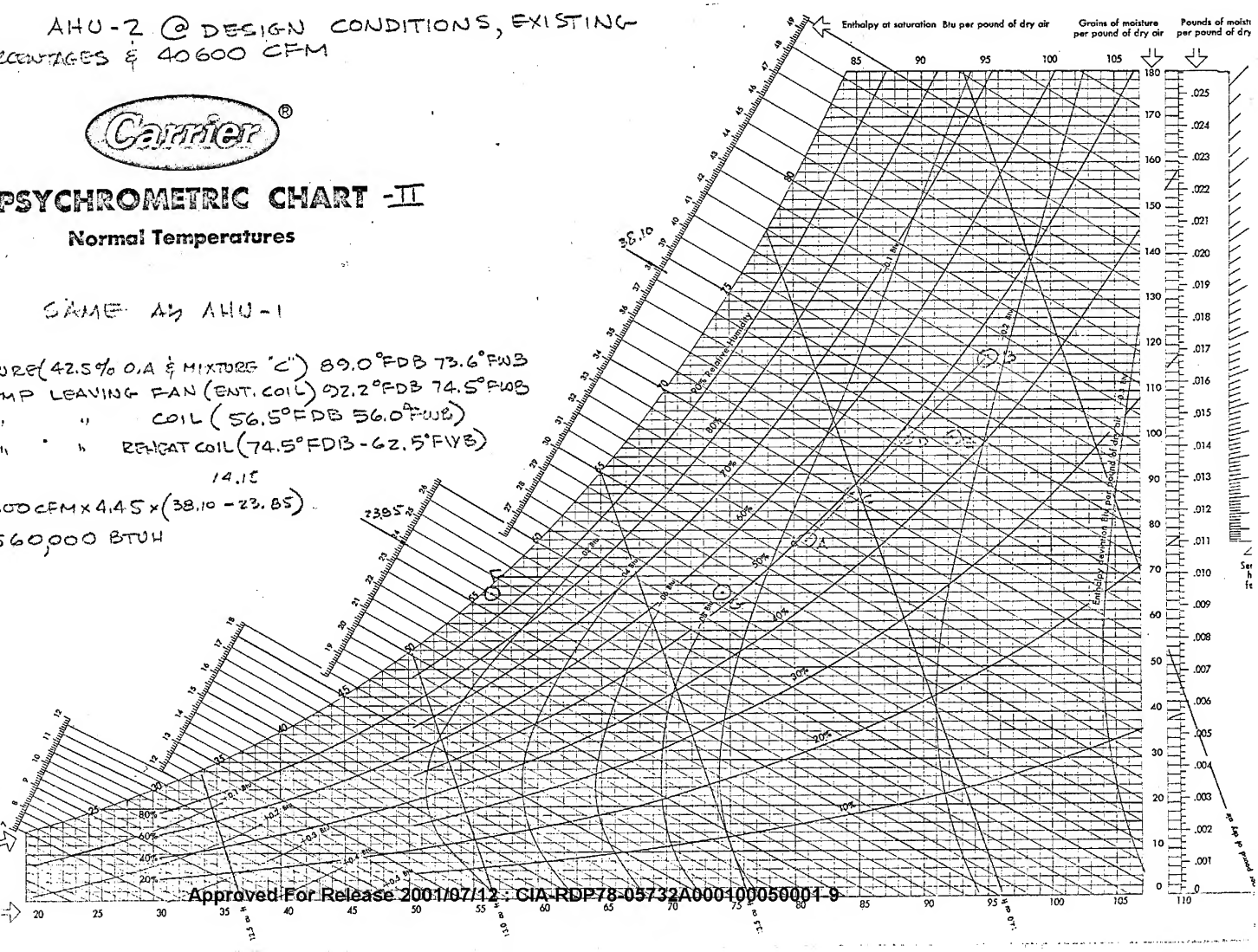
Normal Temperatures

A
B SAME AS AHU-1
C
D = MIXTURE (42.5% O.A & MIXTURE "C") 89.0°FDB 73.6°FWB
E = TEMP LEAVING FAN (ENT. COIL) 92.2°FDB 74.5°FWB
F = " " COIL (56.5°FDB 56.0°FWB)
G = " " REHEAT COIL (74.5°FDB - 62.5°FWB)

$$= 40600\ CFM \times 4.45 \times \frac{(38.10 - 23.85)}{14.1}$$

$$= 2{,}560{,}000\ BTUH$$

APPENDIX B
PAGE 2 OF 5



AHU-3 @ DESIGN CONDITIONS, EXISTING O.A. PERCENTAGES, & 35680 CFM

Carrier®

PSYCHROMETRIC CHART - III

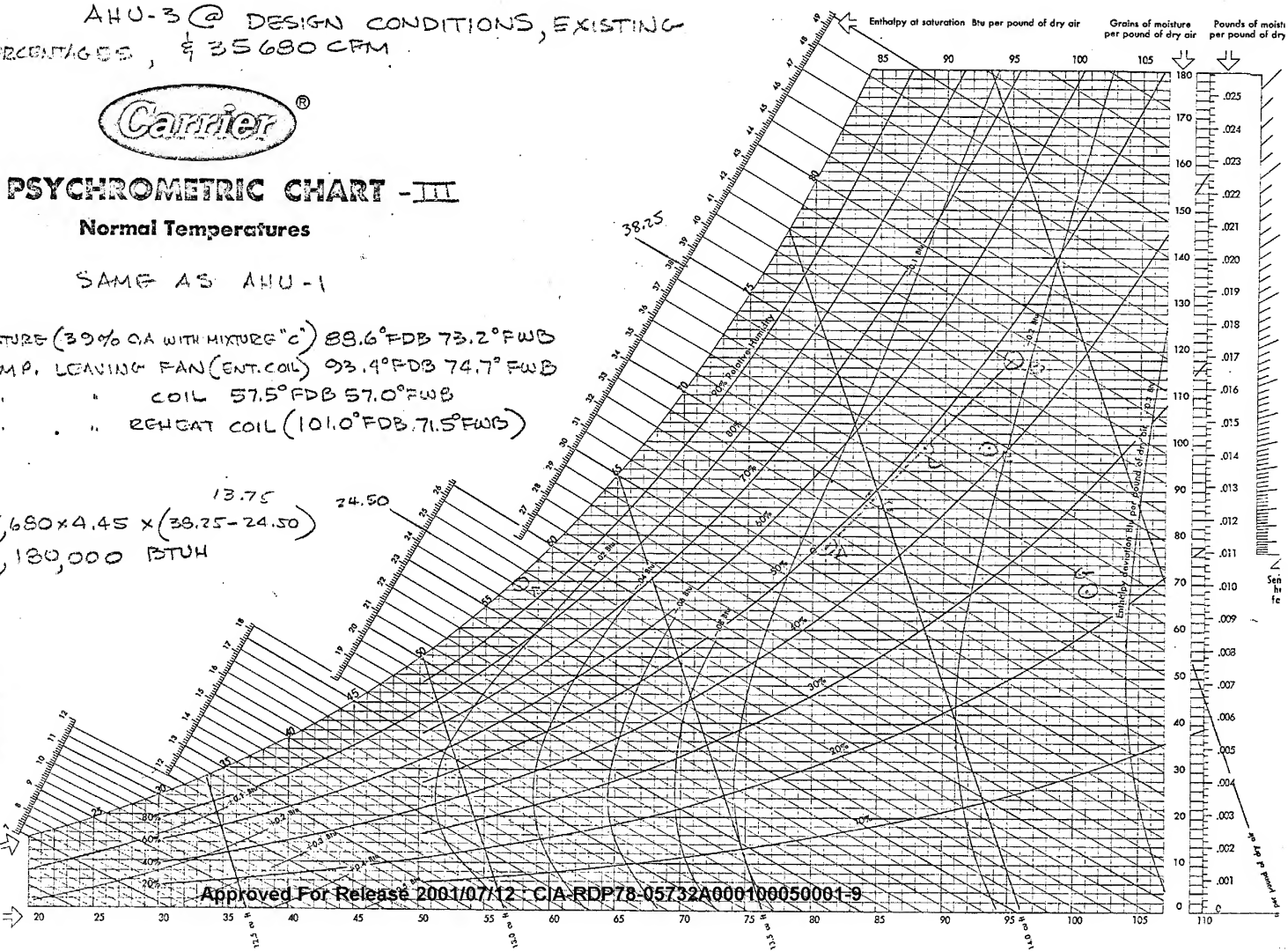
Normal Temperatures

SAME AS AHU-1

A
B
C
D = MIXTURE (39% O.A WITH MIXTURE "C") 88.6°FDB 73.2°FWB
E = TEMP. LEAVING FAN (ENT. COIL) 93.4°FDB 74.7°FWB
F = " " COIL 57.5°FDB 57.0°FWB
G = " " REHEAT COIL (101.0°FDB 71.5°FWB)

38.25 − 24.50 = 13.75

= 35,680 × 4.45 × (38.25 − 24.50)
= 2,180,000 BTUH



PAGE 3 OF 5 APPENDIX B

AHU-4 @ DESIGN CONDITIONS, EXISTING O.A. PERCENTAGES & 52800 CFM

Carrier®

PSYCHROMETRIC CHART - IV

Normal Temperatures

SAME AS AHU-1

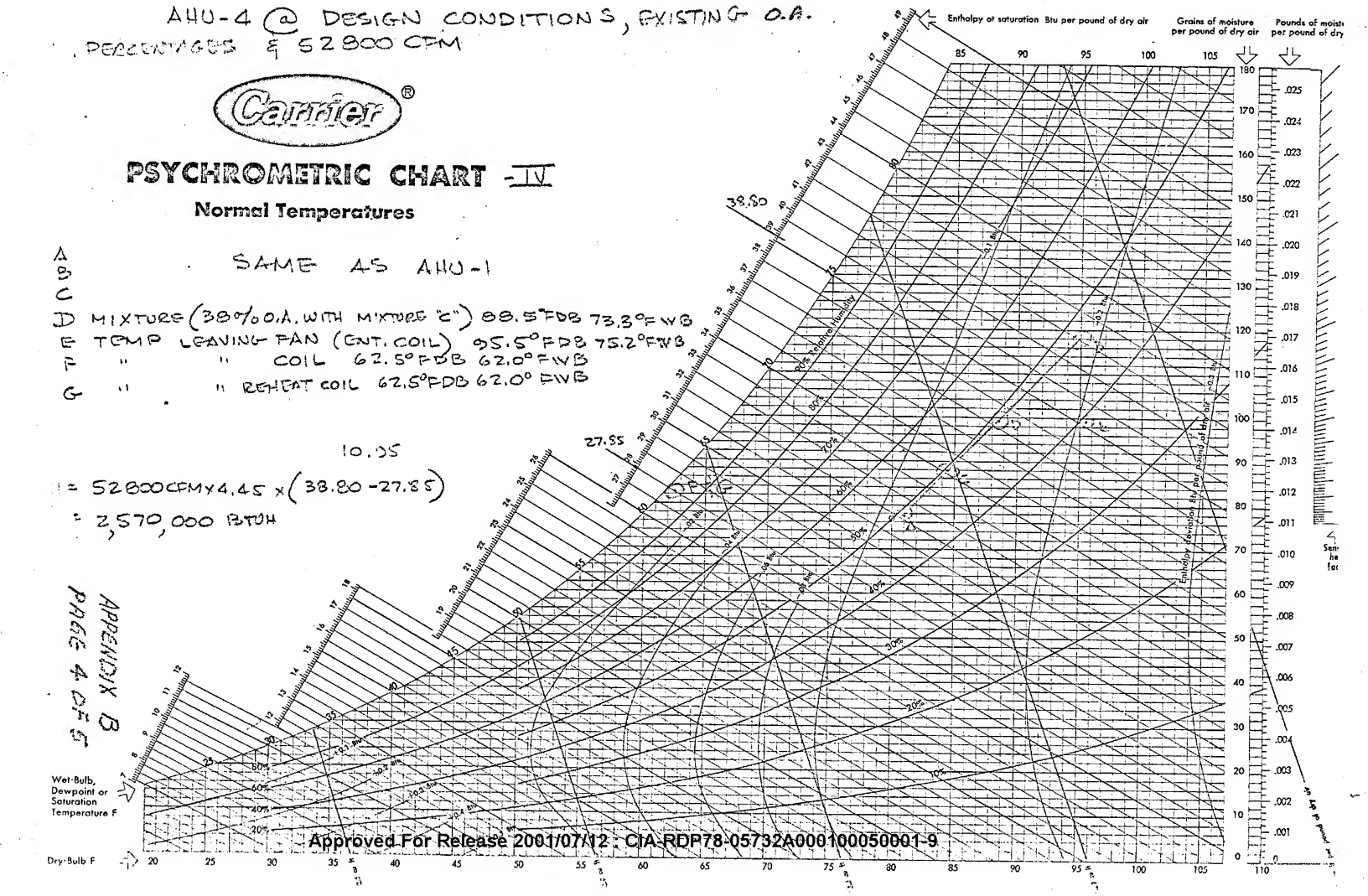
ADJACENT

MIXTURE (38% O.A. WITH MIXTURE "C") 88.5°FDB 73.3°FWB
TEMP LEAVING FAN (CNT. COIL) 95.5°FDB 75.2°FWB
" " COIL 62.5°FDB 62.0°FWB
" " REHEAT COIL 62.5°FDB 62.0°FWB

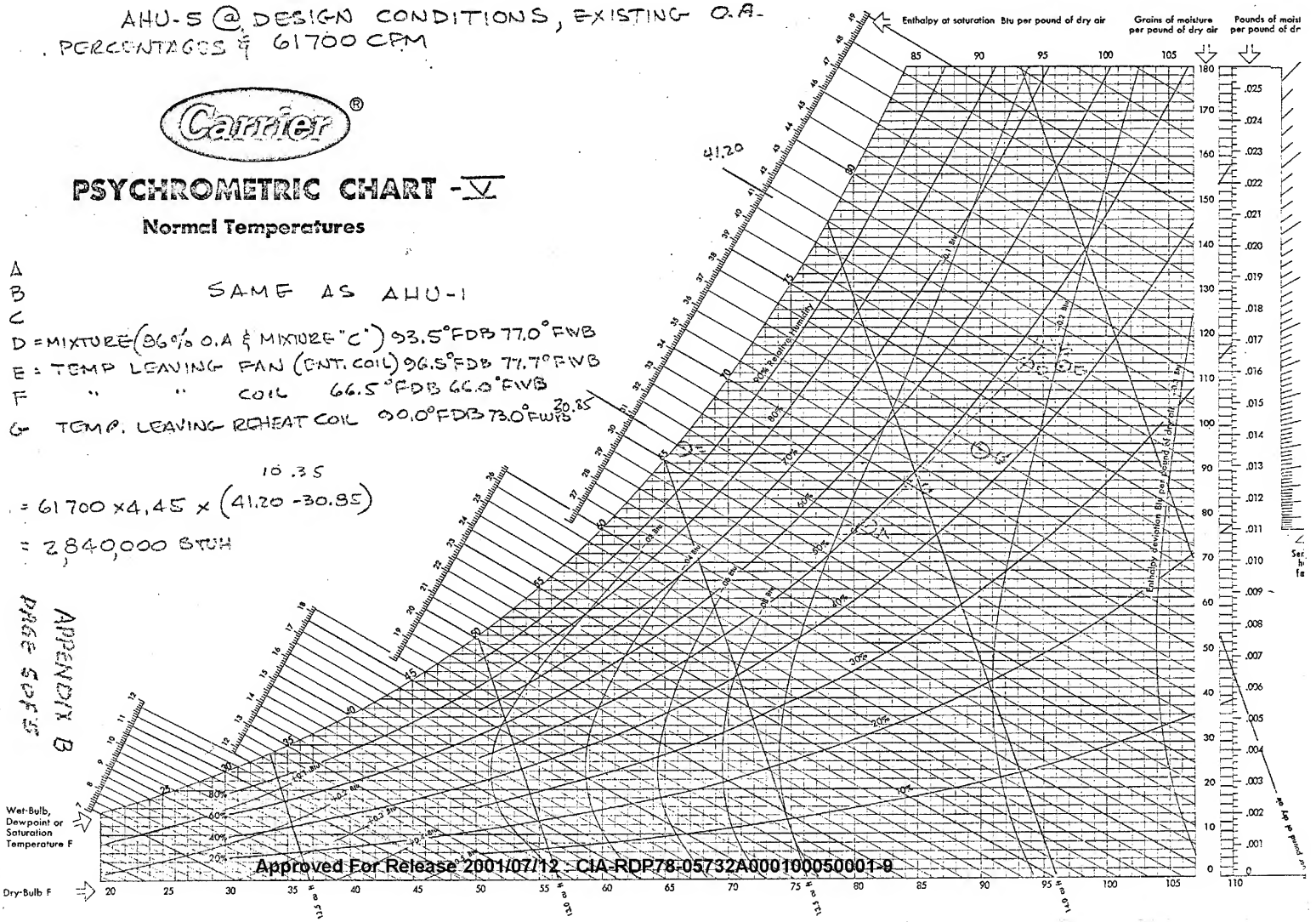
10.95

= 52800CFMX4.45 x (38.80 - 27.85)
= 2,570,000 BTUH

APPENDIX B
PAGE 4 OF 5



AHU-5 @ DESIGN CONDITIONS, EXISTING O.A. PERCENTAGES & 61700 CFM



APPENDIX B
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SECTION 2

APPENDIX C

The following 37 equipment reports indicate the major portion of the data that is pertinent to the larger items of mechanical equipment.

EQUIPMENT REPORT Number 1

1. NAME: Air Handling Unit No. 1.

2. FUNCTION: To supply heated and cooled air to a high velocity dual-duct system.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure readings at various points in the equipment.
   b. Simultaneous temperature readings at various points in the equipment.
   c. Air velocities in main supply ducts.
   d. Fan Motor RPM, running amps and voltage and fan RPM.
   e. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 200 HP, 232 amps @ 440 volts 1180 RPM.

   b. Shop Drawings: Fan - 87000 CFM at 9-1/2" S.P. 1211 RPM 160.6 BHP.

   Cooling Coil: Six sections 10'-10-1/2" x 3'-1-7/16" x 10" each 498 FPM @ 87000 CFM and .59" S.P.drop, 174.8 S.F. face area, entering air 82°FDB and 67.5°FWB leaving air 53.9°FDB (without sprays) and 53°FWB. 782 GPM of chilled water entering at 42°F and leaving at 52°F with 7.5 ft. press. drop thru coil. Total load 3,915,000 BTUH.

   Preheat Coil: Face velocity of 520 FPM at 87000 CFM and .05 inches pressure drop. Air entering at 0°F and leaving at 40°F using 5 psig steam. Face area is 173.1 S.F.

   Reheat Coil: Face velocity of 970 FPM at 43500 CFM and .20 inches pressure drop. Air entering at 40°F and leaving at 85°F. Face area 44.8 S.F.

   c. Design: Filters - Maximum internal pressure drop of 1".

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running. Vibrations at time of readings, indicate need for fan bearings replacement. Preheat coil was relatively clean and clear of obstructions. Reheat coil, cooling coil and sprays can be examined only when system is shut down. No belt guard at time of readings.

7. Life expectancy remaining 3 years..

May 1970

EQUIPMENT REPORT Number 2

1. NAME: Air Handling Unit No. 2

2. FUNCTION: To supply heated and cooled air to a high velocity dual-duct system.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure readings at various points in the equipment.
   b. Simultaneous temperature readings at various points in the equipment.
   c. Air velocities in main supply ducts.
   d. Fan Motor RPM, running amps and voltage and fan RPM.
   e. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 200 HP, 232 amps @ 440 volts 1180 RPM.

   b. Shop Drawings: Fan - 85000 CFM at 9-1/2" S.P. 1198 RPM 155.3 BHP

      Cooling Coil: Six sections 10'-10-1/2" x 3'-1-7/16" x 10" each 498 FPM @ 85000 CFM and .59" S.P. drop, 170.4 S.F. face area, entering air 82°FDB and 67.5° FWB leaving air 53.9°FDB (without sprays) and 53° FWB. 774 GPM of chilled water entering at 42°F and leaving at 52°F with 7.5 ft. press. drop thru coil. Total load 3,825,000 BTUH.

      Preheat Coil: Face velocity of 520 FPM at 85000 CFM and .05 inches pressure drop. Air entering at 0°F and leaving at 40°F using 5 psig steam. Face area is 169.2 S.F.

      Reheat Coil: Face velocity of 950 FPM at 42500 CFM and .20 inches pressure drop. Air entering at 40°F and leaving at 85°F. Face area 44.8 S.F.

   c. Design: Filters - Maximum internal pressure drop of 1".

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running vibrations at time of readings, indicates need for fan bearings replacement. Preheat coil was relatively clean and clear of obstructions. Reheat coil, cooling coil and sprays can be examined only when system is shut down.

7. Life expectancy remaining 3 years:

EQUIPMENT REPORT Number 3

1. NAME: Air Handling Unit No. 3

2. FUNCTION: To supply heated and cooled air to a high velocity dual-duct system.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure readings at various points in the equipment.
   b. Simultaneous temperature readings at various points in the equipment.
   c. Air velocities in main supply ducts.
   d. Fan motor RPM, running amps and voltage and fan RPM.
   e. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 200 HP, 232 amps @ 440 volts 1180 RPM.

   b. Shop Drawings: Fan - 85000 CFM at 9-1/2" S.P. 1198 RPM 155.3 BHP

      Cooling Coil: Six sections 10'-10-1/2" x 3'-1-7/16" x 10" each 498 FPM @ 85000 CFM and .59" S.P.drop, 170.4 S.F. face area, entering air 82°FDB and 67.5°FWB leaving air 53.9°FDB (without sprays) and 53°FWB. 774 GPM of chilled water entering at 42°F and leaving at 52°F with 7.5 ft. press. drop thru coil. Total load, 3,825,000 BTUH.

      Preheat Coil: Face velocity of 502 FPM at 85000 CFM and .05 inches pressure drop. Air entering at 0°F and leaving at 40°F using 5 psig steam. Face area is 169.2 S.F.

      Reheat Coil: Face velocity of 950 FPM at 42500 CFM and .20 inches pressure drop. Air entering at 40°F and leaving at 85°F. Face area 44.8 S.F.

   c. Design: Filters - Maximum internal pressure drop of 1".

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running. Vibrations at time of readings, indicate need for fan bearings replacement. Preheat coil was relatively clean and clear of obstructions. Reheat coil, cooling coil and sprays can be examined only when system is shut down. No belt gaard at time of readings.

7. Life expectancy remaining 3 years.

EQUIPMENT REPORT Number 4

1. NAME: Air Handling Unit No. 4

2. FUNCTION: To supply heated and cooled air to a high velocity dual-duct system.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure readings at various points in the equipment.
   b. Simultaneous temperature readings at various points in the equipment.
   c. Air velocities in main supply ducts .
   d. Fan motor RPM, running amps and voltage and fan RPM.
   e. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 200 HP, 232 amps @ 440 volts 1180 RPM.

   b. Shop Drawings: Fan - 85000 CFM at 9-1/2" S.P. 1198 RPM 155.3 BHP

      Cooling Coil: Six sections 10'-10-1/2" x 3'-1-7/16" x 10" each 498 FPM @ 85000 CFM and .59" S.P. drop, 170.4 S.F. face area, entering air 82°FDB and 67.5°FWB leaving air 53.9°FDB (without sprays) and 53°FWB. 774 GPM of chilled water entering at 42°F and leaving at 52°F with 7.5 ft. press. drop thru coil. Total load, 3,825,000 BTUH.

      Preheat Coil: Face velocity of 520 FPM at 85000 CFM and .05 inches pressure drop. Air entering at 0°F and leaving at 40°F using 5 psig steam. Face area is 169.2 S.F.

      Reheat Coil: Face velocity of 950 FPM at 42500 CFM and .20 inches pressure drop. Air entering at 40°F and leaving at 85°F. Face Area 44.8 S.F.

   c. Design: Filters - Maximum internal pressure drop of 1".

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running. Vibrations at time of readings, indicate need for fan bearings replacement. Preheat coil was relatively clean and clear of obstructions. Reheat coil, cooling coil and sprays can be examined only when system is shut down.

7. Life expectancy remaining 3 years.

EQUIPMENT REPORT Number 5

1. NAME: Air Handling Unit No. 5

2. FUNCTION: To supply heated and cooled air to a high velocity dual-duct system.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure readings at various points in the equipment.
   b. Simultaneous temperature readings at various points in the equipment.
   c. Air velocities in main supply ducts.
   d. Fan motor RPM, running amps and voltage and fan RPM.
   e. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 200 HP, 232 amps @ 440 volts 1180 RPM.

   b. Shop Drawings: Fan - 85000 CFM at 9-1/2" S.P. 1198 RPM 155.3 BHP

      Cooling Coil: Six sections 10'-10-1/2" x 3'1-7/16" x 10" each 498 FPM @ 85000 CFM and .59" S.P. drop, 170.4 S.F. face area, entering air 76°FDB and 64.0° FWB leaving air 53.9°FDB (without sprays) and 53° FWB. 782 GPM of chilled water entering at 42°F and leaving at 52°F with 7.5 ft. press. drop thru coil. Total load 2,780,000 BTUH.

      Preheat Coil: Face velocity of 502 FPM at 85000 CFM and .05 inches pressure drop. Air entering at 0°F and leaving at 40°F using 5 psig steam. Face area is 169.2 S.F.

      Reheat Coil: Face velocity of 950 FPM at 42500 CFM and .20 inches pressure drop. Air entering at 40°F and leaving at 85°F. Face Area 44.8 S.F.

   c. Design: Filters - Maximum internal pressure drop of 1".

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running. Vibrations, at the time of readings, indicate need for fan bearings replacement. Preheat coil was relatively clean and clear of obstructions. Reheat coil, cooling coil and sprays can be examined only when system is shut down. No belt guard at time of readings.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 6

1. NAME: Fan No. 13

2. FUNCTION: To return air from the spaces served by the Air Handling Units to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 5o-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan - 40000 CFM @ 4" S.P., 770 RPM, 35 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 7

1. NAME: Fan No. 14

2. FUNCTION: To return air from the spaces served by the Air Handling Units to a common return air plenum.

3. FIELE DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 8

1. NAME: Fan No. 15

2. FUNCTION: To return air from the spaces served by the Air Handling Units to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWINGS DATA:

   a. Nameplate: Fan motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 9

1. NAME: Fan No. 16

2. FUNCTION: To return air from the spaces seryed by the Air Handling Units to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S,P., 770 RPM, 35 BHP
      2180 FPM Outlet Velocity

6. EQUIPMENT CONDITION:

The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 10

1. NAME: Fan No. 17

2. FUNCTION: To return air from the spaces served by the Air Handling Units to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan Motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP
   2180 FPM Outlet Velocity

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 11

1. NAME: Fan No. 18

2. FUNCTION: To return air from the spaces served by the Air Handling Unit to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor RPM, running amps and voltage, fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts, 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 12

1. NAME: Fan No. 19

2. FUNCTION: To return air from the spaces served by the Air Handling Units to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan

   b. Air velocity

   c. Fan motor RPM, running amps and voltage, fan RPM.

   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 13

1. NAME: Fan No. 20

2. FUNCTION: To return air from the spaces served by the Air Handling Unit to a common return air plenum.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan

   b. Air velocity

   c. Fan motor RPM, running amps and voltage, fan RPM.

   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 40 HP, 50-amps, @ 440-volts 1175 RPM.

   b. Shop Drawings: Fan 40000 CFM @ 4" S.P., 770 RPM, 35 BHP
   2180 FPM Outlet Velocity

6. EQUIPMENT CONDITION:

The fan and motor were examined only while running and appeared in good condition. Belt guard not on at time of readings.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT Report Number 14

1. NAME: Fan No. 6 - G.S.A. Shop

2. FUNCTION: To exhaust air from the areas.

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity

   b. Discharge size.

   c. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 7.5 HP, 9.5-amps, @ 440 volts 1750 RPM.

   b. Shop Drawings: Fan - 5000 CFM @ 3.5" S.P. 1374 RPM, 3.45 BHP
   Motor - 5 HP 1800 RPM 440 Volt 3 phase 60 cycles

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 15

1. NAME: Fan No. 7

2. FUNCTION: General exhaust

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity
   b. Discharge size
   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 5 HP 6.8-amps, @ 440-volts 1725 RPM.

   b. Shop Drawings: Fan 7400 CFM @ 3.5" S.P., 1293 RPM, 4.84 BHP

6. EQUIPMENT CONDITION:

   The fan is running property and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 16

1. NAME: Fan No. 8

2. FUNCTION: General Exhaust

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity.
   b. Discharge size.
   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 5 HP, 6.8-amps, @ 440-volts, 1725 RPM.

   b. Shop Drawings: Fan - 6000 CFM @ 3.5" S.P., 1243 RPM, 4.18 BHP

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 17

1. NAME: Fan No. 9

2. FUNCTION: General Exhaust

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity

   b. Discharge size

   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 5 HP, 6.8-amps, @ 440-volts 1725 RPM.

   b. Shop Drawings: Fan 6000 CFM @ 3.5" S.P., 1243 RPM, 4.18 BHP

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 18

1. NAME: Fan No. 10

2. FUNCTION: General Exhaust

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity
   b. Discharge size
   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 5 HP, 6.8-amps, @ 440-volts 1725 RPM.

   b. Shop Drawings: Fan 6000 CFM @ 3.5" S.P., 1243 RPM, 4.18 BHP

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 19

1. NAME: Fan No. 11

2. FUNCTION: General Exhaust

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity
   b. Discharge size
   c. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 5 HP, 6.8-amps, @ 440-volts 1725 RPM.

   b. Shop Drawings: Fan 6000 CFM @ 3.5" S.P., 1243 RPM, 4.18 BHP

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof unit appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 20

1. NAME: Fan No. 21

2. FUNCTION: To exhaust air from the spaces served by the Air Handling Unit No. 5.

3. FIELD DATA TO BE ACQUIRED:

   a. Static pressure of fan
   b. Air velocity
   c. Fan motor, RPM, and fan RPM.
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 100 HP, 123-amps, @ 400-volts 885 RPM.

   b. Shop Drawings: Fan 85000 CFM @ 4" S.P., 521 RPM, 75 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 21

1. NAME: Fan No. 22

2. FUNCTION: To exhaust air from G.S.A. space

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity
   b. Discharge size
   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 1.5 HP, 2.6-amps, @ 440-volts

   b. Shop Drawings: Fan 5000 CFM @ 1" S.P., 637 RPM, 1.2 BHP

6. EQUIPMENT CONDITION:

   The fan and motor were examined only while running and appeared in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 22

1. NAME: Fan No. 23 - Kitchen

2. FUNCTION: To exhaust air from spaces.

3. FIELD DATA TO BE ACQUIRED:

   a. Discharge velocity
   b. Discharge size
   c. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 10 HP, 13.5-amps, @ 440-volts 1160 RPM.

   b. Shop Drawings: Fan 12000 CFM @ 3-1/2" S.P., 1632 RPM, 9.5 BHP

6. EQUIPMENT CONDITION:

   The fan is running properly and as a weatherproof units appears in good condition.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 23

1. NAME: Chiller No. 1

2. FUNCTION: To supply chilled water to the cooling coils of the Air Handling Units.

3. FIELD DATA TO BE ACQUIRED:

   a. Total chilled water flow
   b. Temperatures of chilled water entering and leaving chiller
   c. Total condenser water flow
   d. Temperatures of condenser water entering and leaving chiller

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Design: 800 Tons Capacity
   1920 GPM of 42°F chilled water
   3100 GPM of 85°F Condenser Water
   Maximum pressure drop thru cooler = 15 ft.
   Maximum pressure drop thru condenser and absorber combined = 25 ft.
   440 volt.

6. EQUIPMENT CONDITION:

   The solution pump has had problems. The seals need replacement too frequently.

7. Life expectancy remaining 3 year.

May 1970

EQUIPMENT REPORT Number 24

1. NAME: Chiller No. 2

2. FUNCTION: To supply chilled water to the cooling coils of the Air Handling Units.

3. FIELD DATA TO BE ACQUIRED:

   a. Total chilled water flow
   b. Temperatures of chilled water entering and leaving chiller.
   c. Total condenser water flow
   d. Temperatures of condenser water entering and leaving chiller.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Design: 800 Tons Capacity
   1920 GPM of 42°F chilled water
   3100 GPM of 85°F Condenser Water
   Maximum pressure drop thru cooler = 15 ft.
   Maximum pressure drop thru condenser and absorber combined = 25 ft. 400 volt.

6. EQUIPMENT CONDITION:

   The solution pump has had problems. The seals need replcement too frequently.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 25

1. NAME: Chiller No. 3

2. FUNCTION: To supply chilled water to the cooling coils of the Air Handling Units.

3. FIELD DATA TO BE ACQUIRED:

   a. Total chilled water flow
   b. Temperatures of chilled water entering and leaving chiller
   c. Total condenser water flow
   d. Temperatures of condenser water entering and leaving chiller

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Design: 748 tons capacity
   1790 GPM of 44°F Chilled water
   2760 GPM of 85°F Condenser Water
   Maximum pressure drop thru cooler = 8.1 ft.
   Maximum pressure drop thru condenser and absorber combined = 32.3 ft. 440 volt.

6. EQUIPMENT CONDITION:

   The solution pump has had problems. The seals need replacement too frequently.

7. Life expectancy remaining 7 years.

May 1970

EQUIPMENT REPORT Number 26

1. NAME: Chilled Water Pump P-1

2. FUNCTION: Circulating chilled water from Chiller No. 1

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump
   b. Flow
   c. RPM
   d. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 50 HP 60 amps 440V 1760 RPM

   b. Shop Drawings: 1920 GPM @ 75 ft. total dynamic head, 82% efficiency
      50 HP 1750 RPM

6. EQUIPMENT CONDITION

   The seals need normal maintenance.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 27

1. NAME: Condenser Water Pump P-2

2. FUNCTION: Circulating Condenser water to Chiller No. 1.

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump
   b. Flow
   c. RPM
   d. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 100HP 115 amps 440 V 1765 RPM

   b. Design: 3100 GPM @ 85 ft. total dynamic head, 80% efficiency
      100 HP 1750 RPM

6. EQUIPMENT CONDITION:

   The seals need normal maintenance.

7. Life expectancy remaining 3 year.

May 1970

EQUIPMENT REPORT Number 28

1. NAME: Chilled Water Pump P-2

2. FUNCTION: Circulating chilled water from Chiller No. 2

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump

   b. Flow

   c. RPM

   d. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 50 HP 60 amps 440V 1760 RPM

   b. Shop Drawings: 1920 GPM @ 75 ft. total dynamic head 82% efficiency 50 HP 1750 RPM

6. EQUIPMENT CONDITION:

   The seals need normal maintenance.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 29

1. NAME: Condenser Water Pump P-2

2. FUNCTION: Circulating condenser water to Chiller No. 2

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump
   b. Flow
   c. RPM
   d. Condition of equipment.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 100 HP 115 amps 440V 1765 RPM

   b. Shop Drawings: 3100 GPM @ 85 ft. total dynamic head 80% efficiency
      100 HP 1750 RPM

6. EQUIPMENT CONDITION:

   The seals need normal maintenance.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 30

1. NAME: Chilled Water Pump P-3

2. FUNCTION: Circulating chilled water from Chiller No. 3

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump
   b. Flow
   c. RPM
   d. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 50 HP 62 amps 440V 1745 RPM

   b. Design: 1800 GPM @ 90 ft. total dynamic head

6. EQUIPMENT CONDITION:

   The seals need normal maintenance.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 31

1. NAME: Condenser Water Pump P-3

2. FUNCTION: Circulating condenser water to Chiller No. 3.

3. FIELD DATA TO BE ACQUIRED:

   a. Head pressure entering and leaving pump

   b. Flow

   c. RPM

   d. Condition of equipment

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 100HP 119 amps 440V 1775 RPM

   b. Design: 2800 GPM @ 95 ft. total dynamic head

6. EQUIPMENT CONDITION:

   The seals need normal maintenance.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT Number 32

1. NAME: Cooling Tower No. 1

2. FUNCTION: To cool condenser water from common system serving Chillers.

3. FIELD DATA TO BE ACQUIRED:

   a. Equipment Condition

   b. Fan RPM

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 60 HP 1750 RPM

   b. Design: Capacity to cool 3100 GPM of condenser water from 101.6° to 85° with 78°F wet bulb.

6. EQUIPMENT CONDITION:

   The tower needs some minor maintenance.

7. Life expectancy remaining 1 year.

May 1970

EQUIPMENT REPORT Number 33

1. NAME: Cooling Tower No. 2

2. FUNCTION: To cool condenser water from common system serving Chillers.

3. FIELD DATA TO BE ACQUIRED:

   a. Equipment Condition

   b. Fan RPM

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 60 HP 1750 RPM

   b. Design: Capacity to cool 3100 GPM of condenser water from 101.6° to 85° with 78°F wet bulb.

6. EQUIPMENT CONDITION:

   The tower needs some minor maintenance.

7. Life expectancy remaining 1 years.

May 1970

EQUIPMENT REPORT Number 34

1. NAME: Cooling Tower No. 3

2. FUNCTION: To cool condenser water from common system serving Chillers.

3. FIELD DATA TO BE ACQUIRED:

   a. Equipment Condition

   b. Fan RPM

4. FIELD DATA:

See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: Fan Motor 60 HP 1770 RPM

   b. Design: Capacity to cool 3100 GPM of condenser water from 101.6° to 85° with 78°F wet bulb.

6. EQUIPMENT CONDITION:

   The tower need some minor maintenance.

7. Life expectancy remaining 6 years.

May 1970.

EQUIPMENT REPORT Number 35

1. NAME: Compresors No. A4-1 & A4-2

2. FUNCTION: to maintain pressure in the domestic water tanks.

3. FIELD DATA TO BE ACQUIRED:

   a. Frequency and period of running

   b. Equipment Condition

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 7.5 HP 1740 RPM

   b. Shop Drawings: 7.5 HP 440V 1750 RPM 29 CFM @ 175 psi

6. EQUIPMENT CONDITION: Both compressors appeared in good physical condition.

7. Life expectancy remaining 3 years.

May 1970

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EQUIPMENT REPORT NO. 36

1. NAME: Compressors No. A4-3 & A4-4

2. FUNCTION: Supply compressed air for various uses in building.

3. FIELD DATA TO BE ACQUIRED:

   a. Frequency and period of running

   b. Equipment Condition.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 20 HP 100 CFM 100 psi

6. EQUIPMENT CONDITION: Both compressors appeared in good physical condition.

7. Life expectancy remaining 3 years.

May 1970

EQUIPMENT REPORT NO. 37

1. NAME: Compressors No. A4-5 & A4-6

2. FUNCTION: To supply compressed air for the building and equipment room automatic controls systems.

3. FIELD DATA TO BE ACQUIRED:

   a. Frequency and period of running.

   b. Equipment Condition.

4. FIELD DATA:

   See Appendix D

5. DESIGN, NAMEPLATE OR SHOP DRAWING DATA:

   a. Nameplate: 7.5 HP 29 CFM 175 psi

6. EQUIPMENT CONDITION: Both compressor appeared in good physical condition. Filters need replacement.

7. Life expectancy remaining 3 years.

May 1970

SECTION 2

APPENDIX D

The following pages contain copies of the field data as taken in the field for all of the major pieces of airconditioning equipment.

EQUIPMENT REPORT Nº (AHU-1)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

STATIC PRESSURE

1-1	RETURN AIR PLENUM	-.42 INCHES
1-2	DOWNSTREAM OF FILTERS	-1.17 "
1-3	DOWNSTREAM OF PREHEAT COIL	-1.73 "
1-4	FAN DISCHARGE	+7.47 "
1-5	COLD SUPPLY DUCT	+6.60 "
1-6	HOT SUPPLY DUCT	+6.10 "

TEMPERATURE

TEMPERATURES RECORDED DURING MAXIMUM OUTSIDE AIR TEMPERATURES SEE RECORDER CHART 1 POINTS 1 THRU 6

APPENDIX D
Page 1 of 23

EQUIPMENT REPORT N°1 (AHU-1)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

		PITOT TUBE INSERTED	VELOCITY - FPM
1-1	60" DIA DUCT (COLD)	1.5 INCHES	1500
		5.0	1600
		9.0	1600
		13.5	1650
		20.0	1750
		25.0	1900
		30.0	2000
1-2	60" DIA. DUCT (COLD)	1.5	1950
		5.0	2150
		9.0	2150
		13.5	2150
		20.0	2150
		25.0	2100
		30.0	2100
		AVERAGE	1980
1-3	42" DIA. DUCT (HOT)	1.0 INCHES	2700
		3.5	3450
		6.0	3700
		9.5	3700
		14.0	3550
		21.0	3250
1-4	42" DIA. DUCT (HOT)	1.0	3400
		3.5	3450
		6.0	3500
		9.5	3360
		14.0	3260
		21.0	3250
		AVERAGE	3380

ELECTRICAL

FAN MOTOR - RUNNING AMPS 160

- VOLTAGE 440

- RPM 1160

FAN - RPM

EQUIPMENT REPORT Nº 2 (AHU-2)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

STATIC PRESSURE

2-1	RETURN AIR PLENUM	-.28 INCHES
2-2	DOWNSTREAM OF FILTERS	-.79 "
2-3	DOWNSTREAM OF PREHEAT COIL	-.82 "
2-4	FAN DISCHARGE	+6.20 "
2-5	COLD SUPPLY DUCT	+3.60 "
2-6	HOT SUPPLY DUCT	+3.20 "

TEMPERATURE

TEMPERATURES RECORDED DURING MAXIMUM OUTSIDE AIR TEMPERATURES SEE RECORDER CHART 1 POINTS 7 THRU 12

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EQUIPMENT REPORT N°2 (AHU-2)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

	PITOT TUBE INSERTED	VELOCITY - FPM
(2-1) 60" DIA DUCT (COLD)	1.5 INCHES	1100
	5.0	1300
	9.0	1300
	13.5	1300
	20.0	1300
	34.0	1300
(2-2) 60" DIA. DUCT (COLD)	1.5	900
	5.0	1100
	9.0	1150
	13.5	1150
	20.0	1200
	34.0	1200
	AVERAGE →	1190
(2-3) 42" DIA. DUCT (HOT)	1.0 INCHES	1650
	3.5	1650
	6.0	1700
	9.5	1700
	14.0	1700
	21.0	2000
(2-4) 42" DIA. DUCT (HOT)	1.0	1800
	3.5	2000
	6.0	2000
	9.5	1950
	14.0	1900
	21.0	1900
	AVERAGE →	1790

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	94
	- VOLTAGE	440
	- RPM	1200
FAN	- RPM	970

APPENDIX D
PAGE 4 OF 13

EQUIPMENT REPORT Nº3 (AHU-3)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

STATIC PRESSURE

3-1	RETURN AIR PLENUM	-.29 INCHES
3-2	DOWNSTREAM OF FILTERS	-.60 "
3-3	DOWNSTREAM OF PREHEAT COIL	-.62 "
3-4	FAN DISCHARGE	+9.50 "
3-5	COLD SUPPLY DUCT	+5.70 "
3-6	HOT SUPPLY DUCT	+6.00 "

TEMPERATURE

TEMPERATURES RECORDED DURING MAXIMUM OUTSIDE AIR TEMPERATURES SEE RECORDER CHART II POINTS 1 THRU 6

APPENDIX D
PAGE 5 OF 25

EQUIPMENT REPORT N°4 (AHU-3)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(3-1) 60" DIA DUCT (COLD)

PITOT TUBE INSERTED	VELOCITY - FPM
1.5 INCHES	1300
5.0	1550
9.0	1550
13.5	1600
20.0	1650
30.0	1500

(3-2) 60" DIA. DUCT (COLD)

1.5	1250
5.0	1300
9.0	1300
13.5	1200
20.0	1200
30.0	1500

AVERAGE → 1410

(3-3) 42 " DIA. DUCT (HOT)

1.0 INCHES	700
3.5	850
6.0	850
9.5	850
14.0	900
21.0	900

(3-4) 42" DIA. DUCT (HOT)

1.0	600
3.5	850
6.0	900
9.5	950
14.0	900
21.0	850

AVERAGE → 10100

ELECTRICAL

FAN MOTOR - RUNNING AMPS 120
- VOLTAGE 440
- RPM 1208

FAN - RPM 1140

APPENDIX D
PAGE 2 OF 2

EQUIPMENT REPORT Nº4 (AHU-4)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

STATIC PRESSURE

⬡	RETURN AIR PLENUM	- .32 INCHES
⬡	DOWNSTREAM OF FILTERS	- .82 "
⬡	DOWNSTREAM OF PREHEAT COIL	- .85 "
⬡	FAN DISCHARGE	+ 10. + "
⬡	COLD SUPPLY DUCT	+ 5.20 "
⬡	HOT SUPPLY DUCT	+ 6.10 "

TEMPERATURE

TEMPERATURES RECORDED DURING MAXIMUM OUTSIDE AIR TEMPERATURES SEE RECORDER CHART VI POINTS 1 THRU 6

APPENDIX D
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EQUIPMENT REPORT Nº4 (AHU-4)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

	PITOT TUBE INSERTED	VELOCITY - FPM
(4-1) 60" DIA DUCT (COLD)	1.5 INCHES	1600
	5.0	2100
	9.0	2050
	13.5	2000
	20.0	1850
	30.0	1800
(4-2) 60 " DIA. DUCT (COLD)	1.5	2000
	5.0	2100
	9.0	2050
	13.5	1900
	20.0	1700
	30.0	1850
	AVERAGE →	1920
(4-3) 42 " DIA. DUCT (HOT)	1.0 INCHES	1300
	3.5	1600
	6.0	1650
	9.5	1700
	14.0	1700
	21.0	1700
(4-4) 42" DIA. DUCT (HOT)	1.0	1200
	3.5	1400
	6.0	1500
	9.5	1650
	14.0	1700
	21.0	1750
	AVERAGE →	1570

ELECTRICAL

FAN MOTOR - RUNNING AMPS 147
- VOLTAGE 440
- RPM 1200

FAN - RPM 1217

APPENDIX D
PAGE 8 OF 27

EQUIPMENT REPORT Nº 5 (AHU-5)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

STATIC PRESSURE

⬡	RETURN AIR PLENUM	-.42 INCHES
⬡	DOWNSTREAM OF FILTERS	-1.17 "
⬡	DOWNSTREAM OF PREHEAT COIL	-1.73 "
⬡	FAN DISCHARGE	+7.47 "
⬡	COLD SUPPLY DUCT	+6.60 "
⬡	HOT SUPPLY DUCT	+6.10 "

TEMPERATURE

TEMPERATURES RECORDED DURING MAXIMUM OUTSIDE AIR TEMPERATURES SEE RECORDER CHART IV POINTS 1 THRU 6

APPENDIX D
PAGE 9 OF 25

EQUIPMENT REPORT No 5 (AHU-5)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

	PITOT TUBE INSERTED	VELOCITY - FPM
(5-1) 60" DIA DUCT (COLD)	1.5 INCHES	2350
	5.0	2600
	9.0	2550
	13.5	2550
	20.0	2400
	30.0	2650
(5-2) 60" DIA. DUCT (COLD)	1.5	2700
	5.0	2250
	9.0	2750
	13.5	2850
	20.0	2850
	30.0	2650
	AVERAGE →	2600
(5-3) 30" DIA. DUCT (HOT)	1.0 INCHES	1500
	2.5	2000
	4.5	2200
	7.0	2200
	10.0	2250
	15.0	2300
(5-4) 30 42" DIA. DUCT (HOT)	1.0	1600
	2.5	2300
	4.5	2400
	7.0	2500
	10.0	2500
	15.0	2400
	AVERAGE	2180

ELECTRICAL

FAN MOTOR - RUNNING AMPS 162
- VOLTAGE 440
- RPM 1197
- RPM 1218

APPENDIX D
PAGE 10 OF 21

EQUIPMENT REPORT N° 6 (FAN #13)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(6-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	FPM VELOCITY - JULY	FPM VELOCITY - SEPT.
1.5 INCHES	1800	2000
4.0	1700	1950
7.0	1700	1950
10.0	1800	1900
14.5	1550	1800
22.0	1400	1000
30.0	1700	2000
34.0	1900	2000

AVG. → AVERAGE → 1825

1700

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	32
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	775

STATIC PRESSURE

	JULY	SEPT	
(6-1) FAN INLET	-4.9	-4.3	INCHES
(6-1) FAN OUTLET	-.2	+.2	INCHES

APPENDIX D

PAGE 11 OF 2

EQUIPMENT REPORT N° 7 (FAN #14)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(7-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	FPM VELOCITY-FPM	
	JULY	SEPT
1.5 INCHES	1900	2150
4.0	2000	2100
7.0	1400	2150
10.0	1600	2200
14.5	1400	1900
22.0	1000	1400
30.0	1600	2000
34.0	1600	2200

AVG ~~AVERAGE~~ → 2000
1600

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	36
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	775

STATIC PRESSURE

		JULY	SEPT	
(7-1)	FAN INLET	~~-2.4~~ -3.0	-4.90	INCHES
(7-2)	FAN OUTLET	~~.23~~ .3	+ .27	INCHES

APPENDIX D
PAGE 12 OF 24

EQUIPMENT REPORT N°8 (FAN #15)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(8-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	FPM VELOCITY - FT	
	JULY	SEPT
1.5 INCHES	1100	1750
4.0	1100	1900
7.0	1300	1950
10.0	1100	1950
14.5	800	1800
22.0	1200	1600
30.0	1250	1900
34.0	1300	2050

AVG AVERAGE → 1880

1250

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	35
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	775

STATIC PRESSURE

		JULY	SEPT	
(8-1)	FAN INLET	- 5.2	- 4.80	INCHES
(8-2)	FAN OUTLET	- .2	+ .39	INCHES

APPENDIX D
PAGE 13 OF

EQUIPMENT REPORT N° 9 (FAN #16)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(9-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	FPM VELOCITY-PP JULY	SEPT VELOCITY
1.5 INCHES	500	1500
4.0 "	800	1650
7.0 "	750	1750
10.0 "	1000	1700
14.5 "	800	1700
22.0 "	400	1000
30.0 "	~~1250~~	1550
34.0 "	1300	1850
	AVG → ~~AVERAGE~~ 850	1590

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	32
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	770

STATIC PRESSURE

	JULY	SEPT	
(9-1) FAN INLET	-5.2	-4.60	INCHES
(9-2) FAN OUTLET	+.06	+.44	INCHES

APPENDIX D
PAGE 111 OF 2

EQUIPMENT REPORT N° 10 (FAN #17)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(10-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	JULY VELOCITY	SEPT VELOCITY
1.5 INCHES	1100	1700
4.0 "	1500	1950
7.0 "	1600	2000
10.0 "	1600	2000
14.5 "	1700	1800
22.0 "	1350	1600
30.0 "	1400	2000
34.0 "	1550	2000

FPM VELOCITY = F

AVG → AVERAGE → 1680
1480

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	38
	- VOLTAGE	440
	- RPM	1175
FAN	- RPM	780

STATIC PRESSURE

	JULY	SEPT	
(10-1) FAN INLET	-5.2	-4.7	INCHES
(10-2) FAN OUTLET	-.1	+.4	INCHES

APPENDIX D
PAGE 15 OF 27

EQUIPMENT REPORT N° U (FAN #18)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(11-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	JULY VELOCITY - FPM	SEPT VELOCITY - FPM
1.5 INCHES	400	1650
4.0	200	1800
7.0	100	1950
10.0	100	2000
14.5	100	1900
22.0	500	1000
30.0	1100	1400
34.0	1400	1900
	AVG AVERAGE → 5.00	1700

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	37
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	775

STATIC PRESSURE

		JULY	SEPT	
(11-1)	FAN INLET	-5.2	-4.80	INCHES
(11-2)	FAN OUTLET	-.05	+ .02	INCHES

APPENDIX I
PAGE 16 OF

EQUIPMENT REPORT N°12 (FAN #19)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

FPM
VELOCITY - FP

AIR VELOCITIES

(12-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	JULY VELOCITY	SEPT VELOCITY
1.5 INCHES	1550	2000
4.0	1450	2050
7.0	1500	2000
10.0	1400	2000
14.5	800	1750
22.0	1200	1100
30.0	1350	2000
34.0	1500	2150
AVG. AVERAGE →	1340	1880

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	32
	- VOLTAGE	440
	- RPM	1180
FAN	- RPM	775

STATIC PRESSURE

		JULY	SEPT	
(12-1)	FAN INLET	-5.3	-4.9	INCHES
(12-2)	FAN OUTLET	-0.05	+.3	INCHES

APPENDIX D
PAGE 10 OF 25

EQUIPMENT REPORT N°13 (FAN #20)

FIELD DATA

(FOR LOCATION OF READINGS SEE DRAWINGS)

AIR VELOCITIES

(13-1) 44" DIA DUCT (RETURN)

PITOT TUBE INSERTED	FPM VELOCITY - FF JULY	SEPT VELOCITY
1.5 INCHES	300	1100
4.0	400	1200
7.0	300	1300
10.0	400	1550
14.5	300	800
22.0	300	300
30.0	400	300
34.0	300	1100
	AV ~~GAVERAGE~~ →	960
	340	

ELECTRICAL

FAN MOTOR	- RUNNING AMPS	29
	- VOLTAGE	440
	- RPM	1160
FAN	- RPM	730

STATIC PRESSURE

		JULY	SEPT	
(13-1)	FAN INLET	-5.0	~~-~~ 4.50	INCHES
(13-2)	FAN OUTLET	-.2	-.26	INCHES

APPENDIX D
PAGE 10 OF 23

EQUIPMENT REPORTS 14 THRU 22
FIELD DATA

REPORT NO.	FAN NO.	DISCHARGE VELOCITY	DISCHARGE SIZE
14	6	1700 FPM	35" x 26"
15	7	2800	21" x 29"
16	8	3000	19.5" x 26"
17	9	1900	19.5" x 26"
18	10	3200	19.5" x 26"
19	11	3500	26" x 20"
20	21	1650	65" DIA.
21	22	1900	29" x 21"
22	23	3800	24" x 18"

EQUIPMENT REPORT Nº 23, 24 & 25

FIELD DATA

EQUIPMENT REPORT Nº	CHILLER Nº	CHILLED WATER FLOW (GPM)	CHILLED WATER TEMPERATURES (°F) IN	CHILLED WATER TEMPERATURES (°F) OUT	CONDENSER WATER FLOW (GPM)	CONDENSER WATER TEMPERATURES IN °F	CONDENSER WATER TEMPERATURES °F OUT
23	1	1660	48	42	2700	82	92
24	2	1600	48	42	3000	82	92
25	3	1180	49	42	1760	82	92

APPENDIX D
PAGE 2 OF 2

EQUIPMENT REPORT Nº 26 THRU Nº 31 (PUMPS

FIELD DATA

EQUIP. REPORT NO.	PUMP SERVICE AND NO.	FLOW (GPM)	HEAD PRESSURE (P.S.I.G.) ENTERING	HEAD PRESSURE (P.S.I.G.) LEAVING	RPM
26	CHILLED WATER P-1	1670	28.0	62.0	1790
27	CONDENSER WATER P-1	2700	8.5	52.5	1795
28	CHILLED WATER P-2	1600	27.5	64.5	1785
29	CONDENSER WATER P-2	3010	7.0	53.0	1790
30	CHILLED WATER P-3	1200	29.0	58.0	1785
31	CONDENSER WATER P-3	1760	*	51.0	1805

* GAGE NOT OPERATING

EQUIPMENT REPORT Nº 32, 33 & 34 (COOLING TOWERS No. 1, 2, 3)

FIELD DATA

EQUIPMENT REPORT NO.	COOLING TOWER NO.	FAN MOTOR RPM
32	1	1780
33	2	1775
34	3	1780

EQUIPMENT REPORTS NO 35, 37, & 37 (COMPRESS)

FIELD DATA

EQUIPMENT REPORT N°	COMPRESSOR N°	FREQUENCY * OF STARTS	TIME RUNNING
35	A 4-1	6 minutes	15 seconds
35	A 4-2	6 minutes	3 seconds
36	A 4-3	14 minutes	3.5 minutes
36	A 4-4	14 minutes	3 minutes
37	A 4-5	6 minutes	1 minutes 45 seconds
37	A 4-6	6 minutes	2 minutes 15 seconds

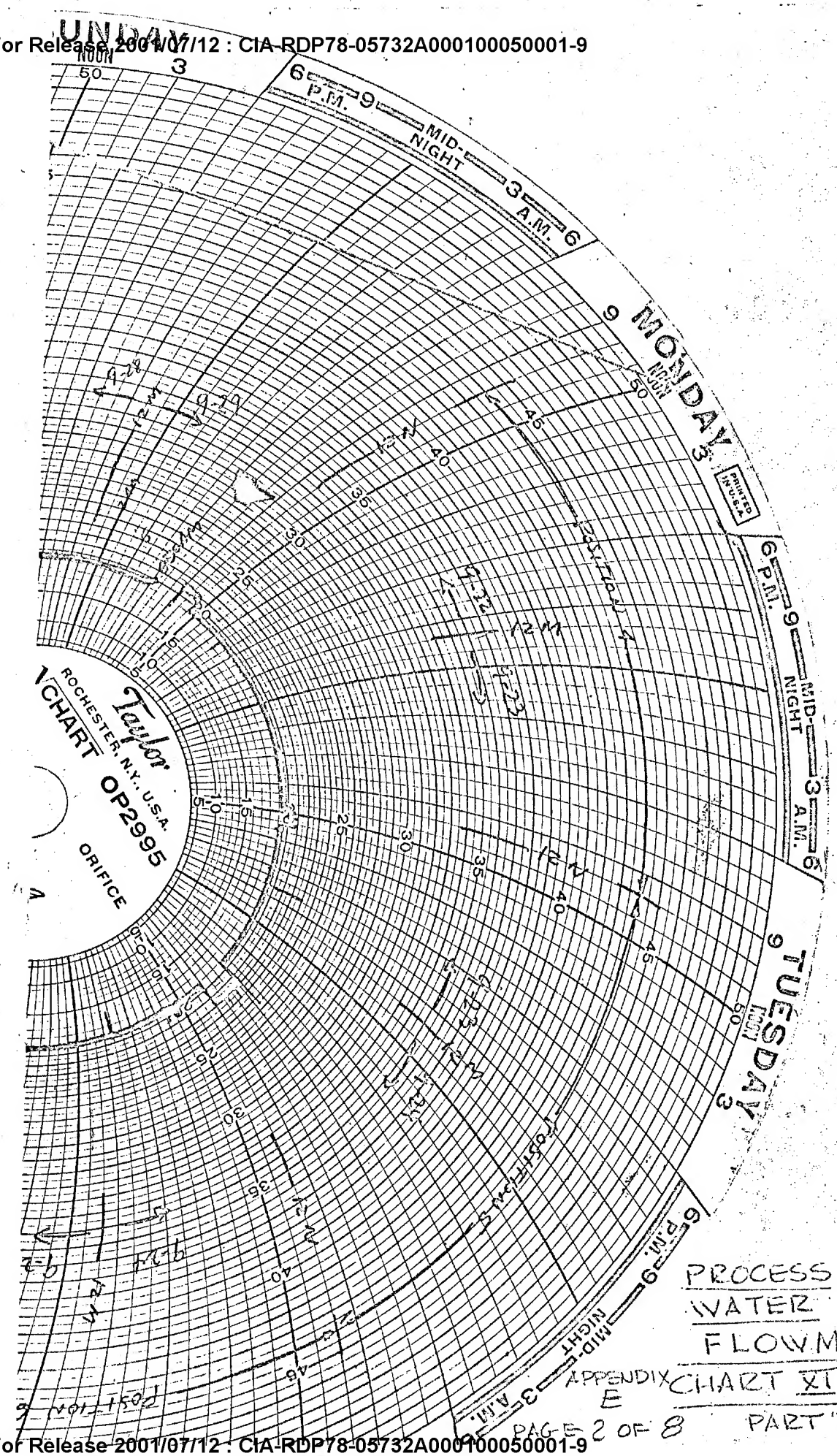
APPENDIX D
PAGE 23 OF 23

* Compressors Alternate - time indicated is for the same compress

SECTION 2

APPENDIX E

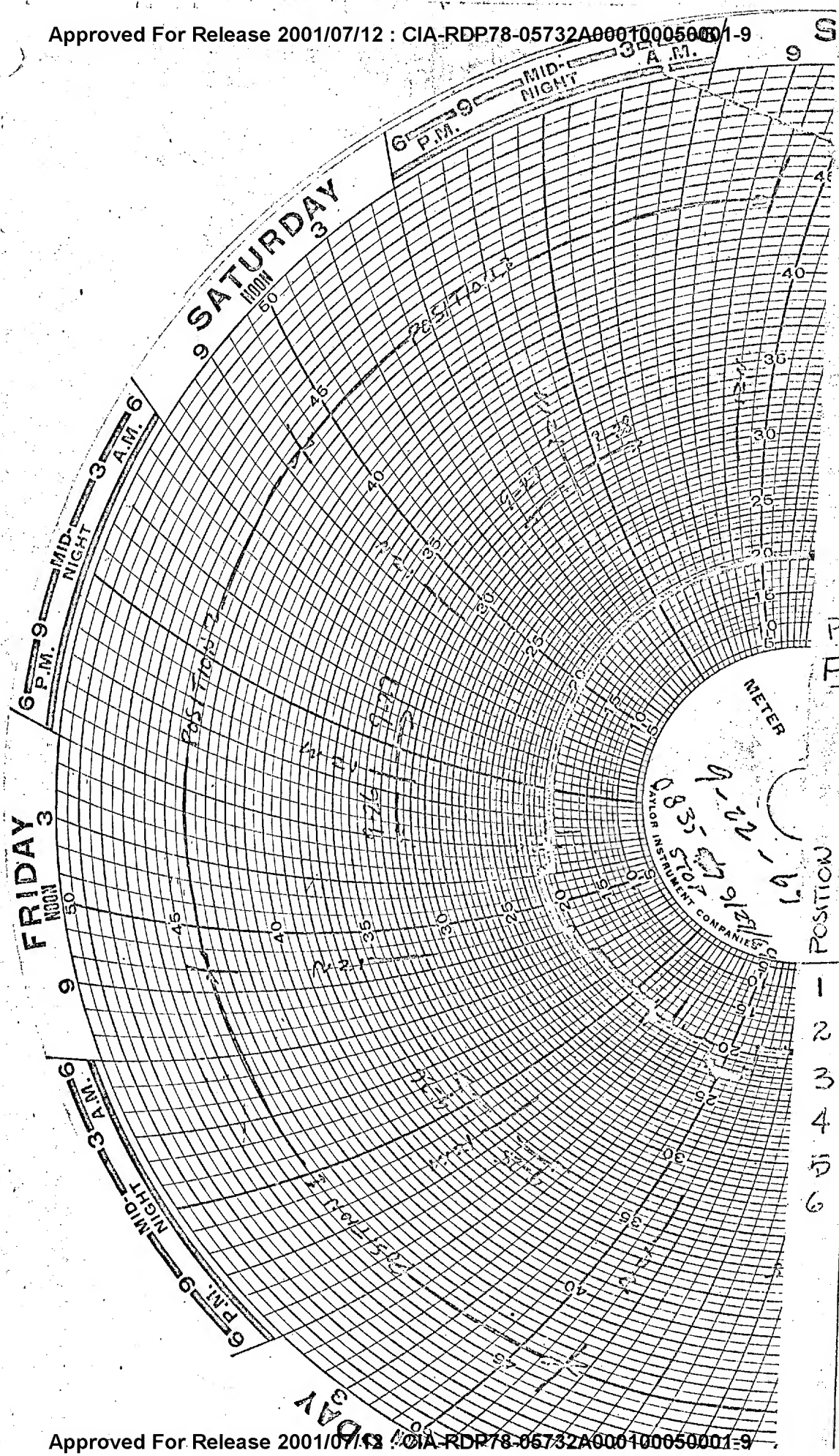
The following charts are for the temperatures and flow rates of the process water system.



PROCESS
WATER
FLOW METER

APPENDIX E CHART XI

PAGE 2 OF 8 PART "B"



NOTE:
FLOW IS IN GPM

POSITIONS 4, 5 & 6 ARE DIRECT READING

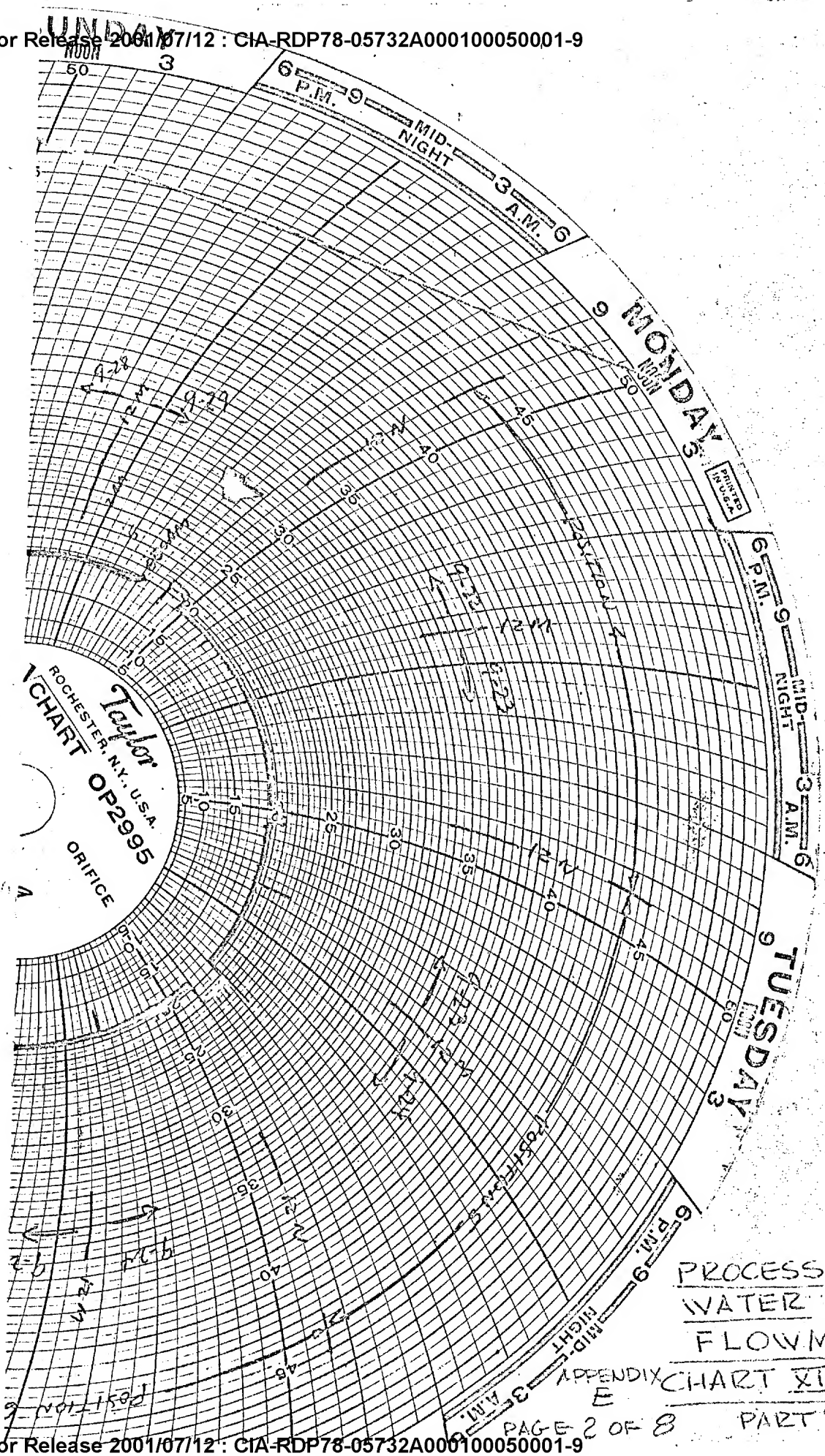
POSITIONS 1, 2 & 3 REQUIRE A MULTIPLIER OF .3

PROCESS WATER FLOW METER CHART XI

PART A

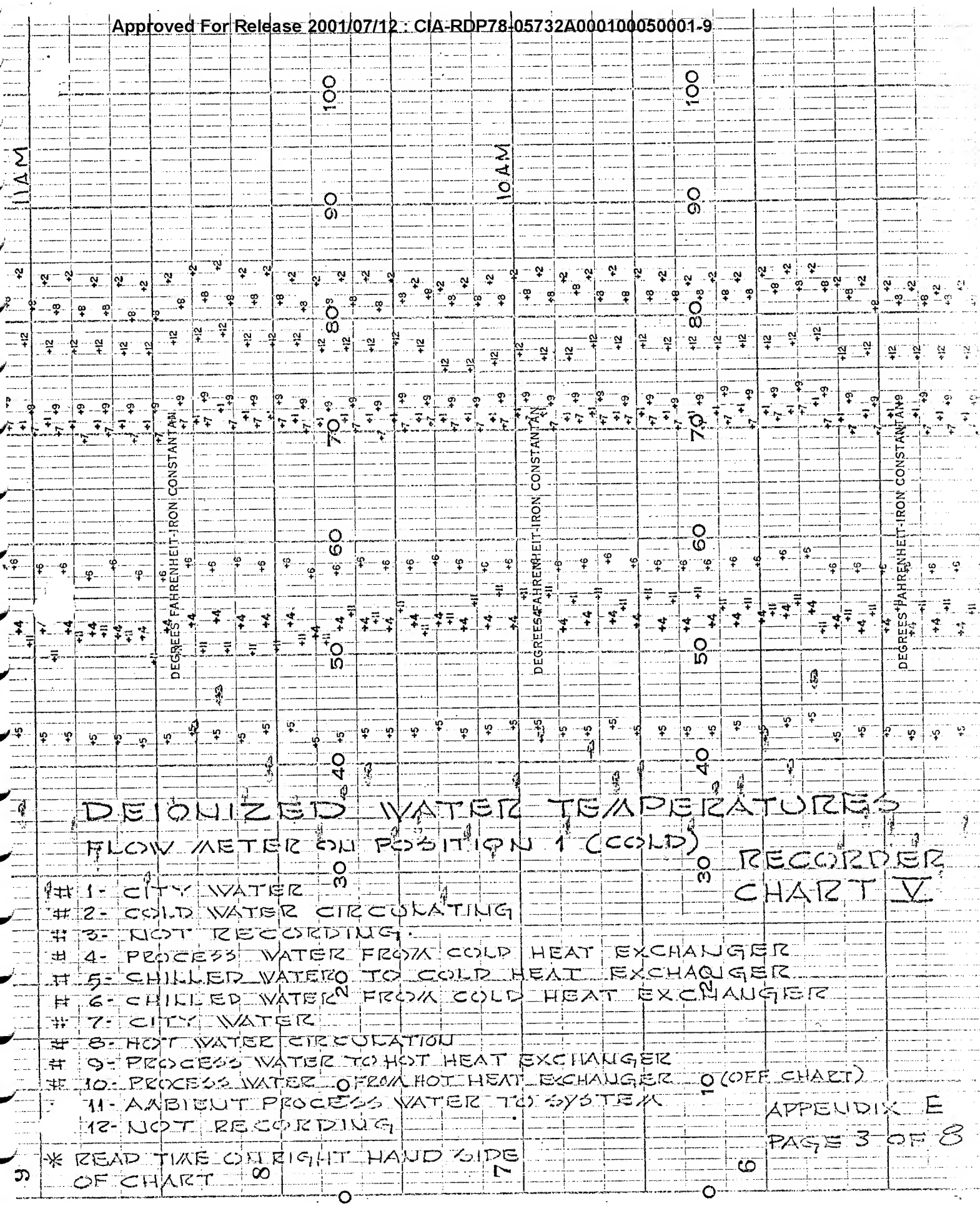
POSITION	DEFINITION
1	45° DEIONIZED
2	68° "
3	145° "
4	145° FILTERED
5	68° "
6	45° "

APPENDIX E
PAGE 1 OF 8



PROCESS WATER FLOWMETER CHART XI

APPENDIX E PAGE 2 OF 8 PART "B"



DEIONIZED WATER TEMPERATURES

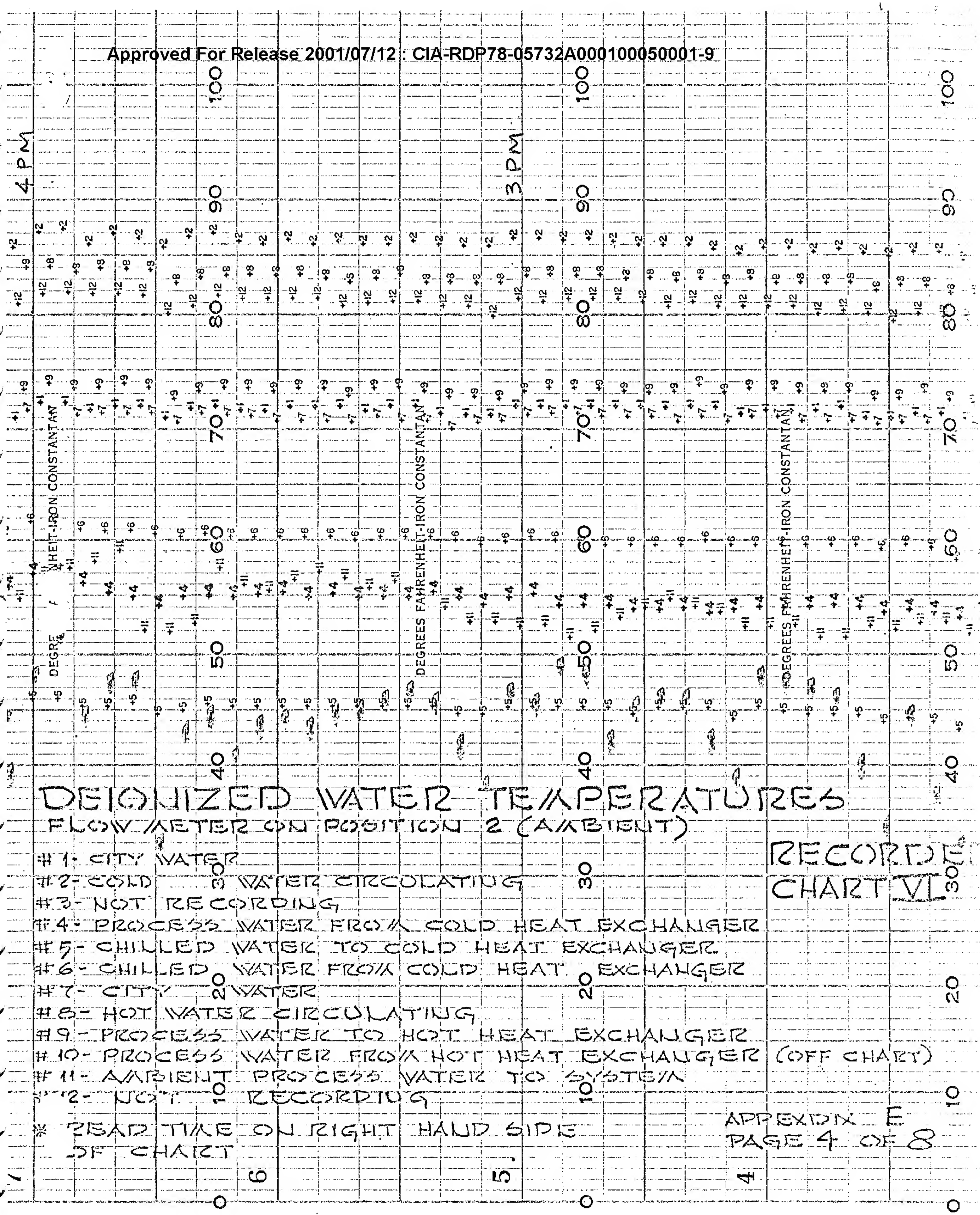
FLOW METER ON POSITION 1 (COLD)

RECORDER CHART V

#1- CITY WATER
#2- COLD WATER CIRCULATING
#3- NOT RECORDING.
#4- PROCESS WATER FROM COLD HEAT EXCHANGER
#5- CHILLED WATER TO COLD HEAT EXCHANGER
#6- CHILLED WATER FROM COLD HEAT EXCHANGER
#7- CITY WATER
#8- HOT WATER CIRCULATION
#9- PROCESS WATER TO HOT HEAT EXCHANGER
#10- PROCESS WATER FROM HOT HEAT EXCHANGER (OFF CHART)
#11- AMBIENT PROCESS WATER TO SYSTEM
#12- NOT RECORDING

* READ TIME ON RIGHT HAND SIDE OF CHART

APPENDIX E
PAGE 3 OF 8

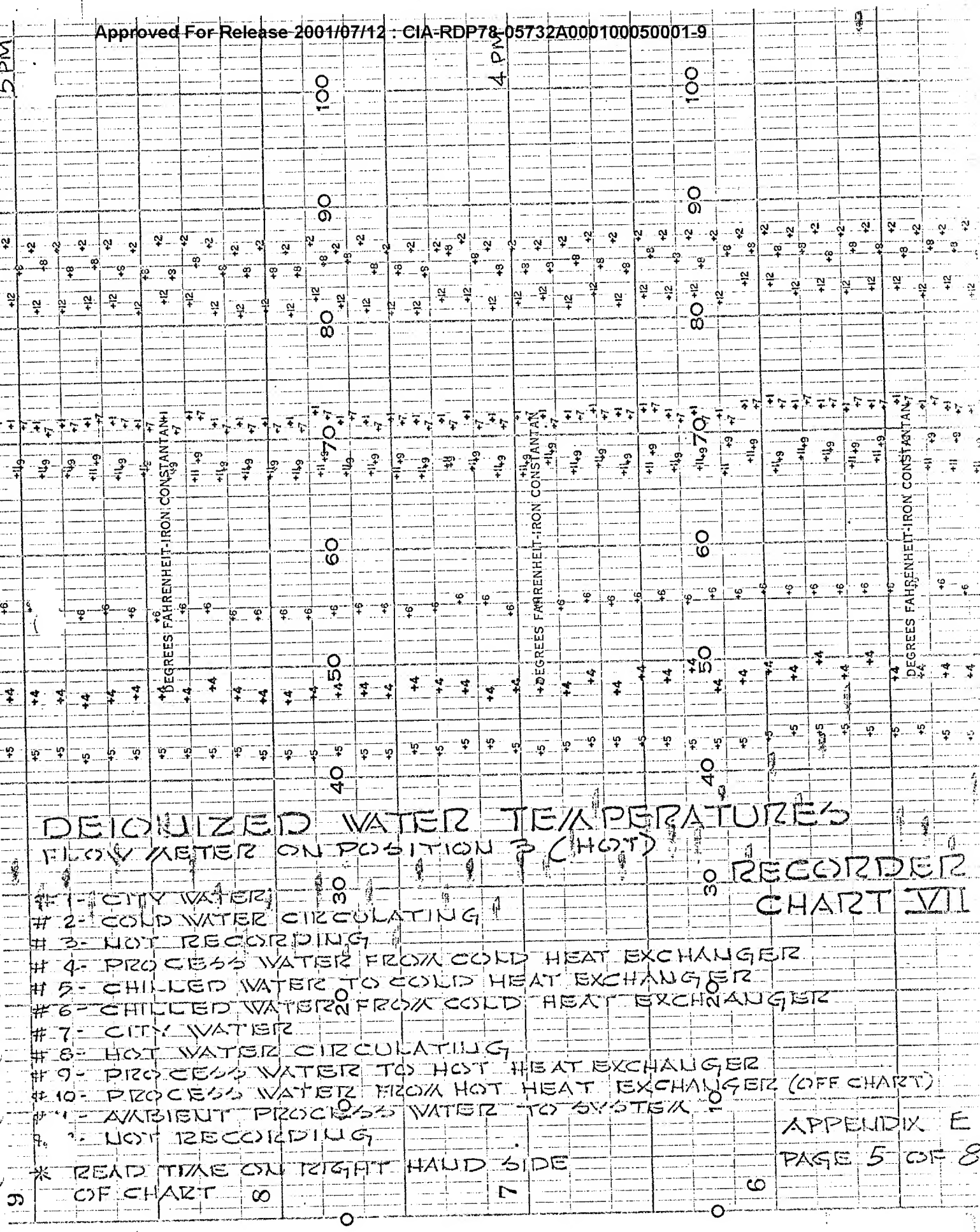


DEIONIZED WATER TEMPERATURES
FLOW METER ON POSITION 2 (AMBIENT)

RECORDER CHART VI

#1- CITY WATER
#2- COLD WATER CIRCULATING
#3- NOT RECORDING
#4- PROCESS WATER FROM COLD HEAT EXCHANGER
#5- CHILLED WATER TO COLD HEAT EXCHANGER
#6- CHILLED WATER FROM COLD HEAT EXCHANGER
#7- CITY WATER
#8- HOT WATER CIRCULATING
#9- PROCESS WATER TO HOT HEAT EXCHANGER
#10- PROCESS WATER FROM HOT HEAT EXCHANGER (OFF CHART)
#11- AMBIENT PROCESS WATER TO SYSTEM
#12- NOT RECORDING
* READ TIME ON RIGHT HAND SIDE OF CHART

APPENDIX E
PAGE 4 OF 8



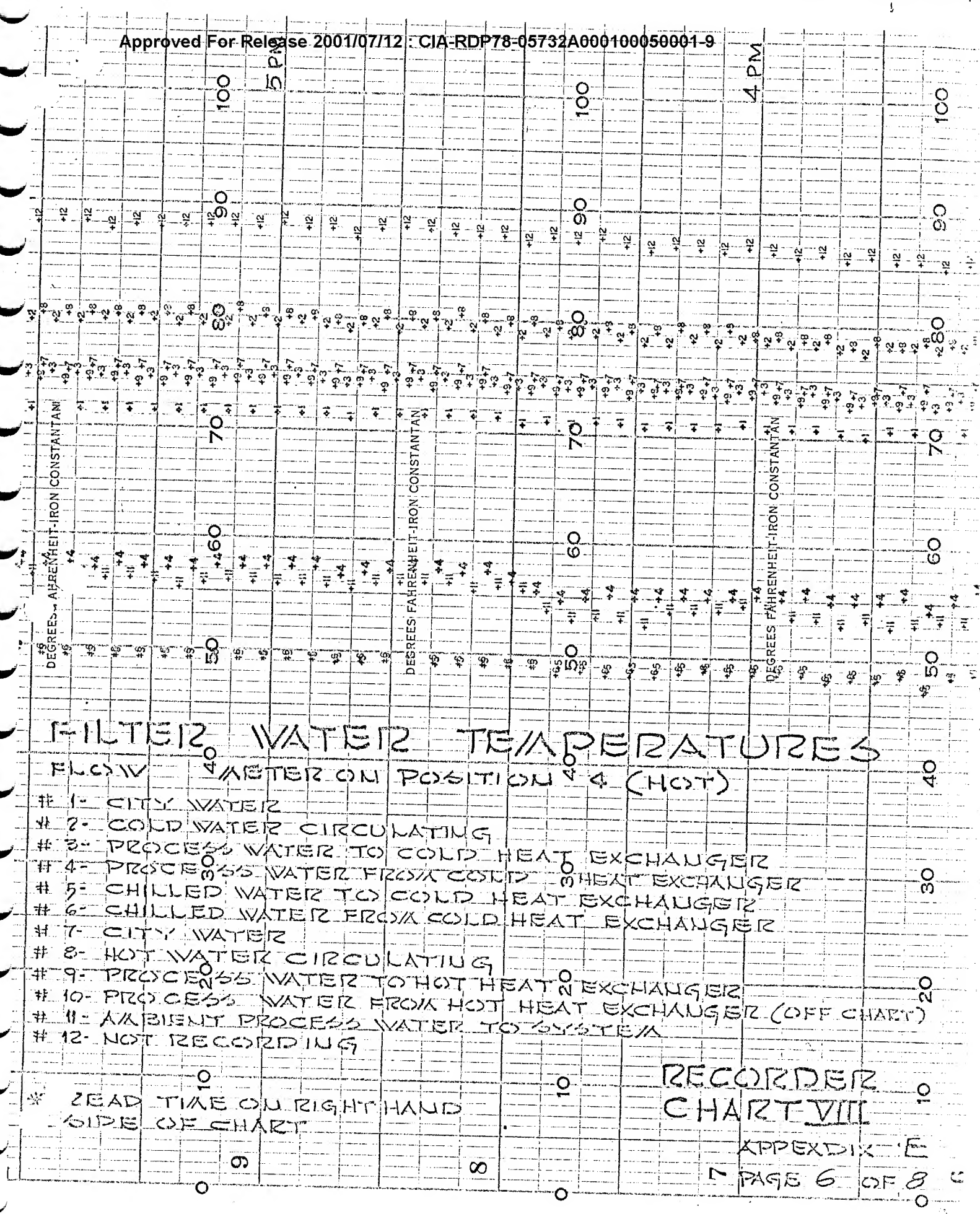
DEIONIZED WATER TEMPERATURES
FLOW METER ON POSITION 2 (HOT)
RECORDER
CHART VII

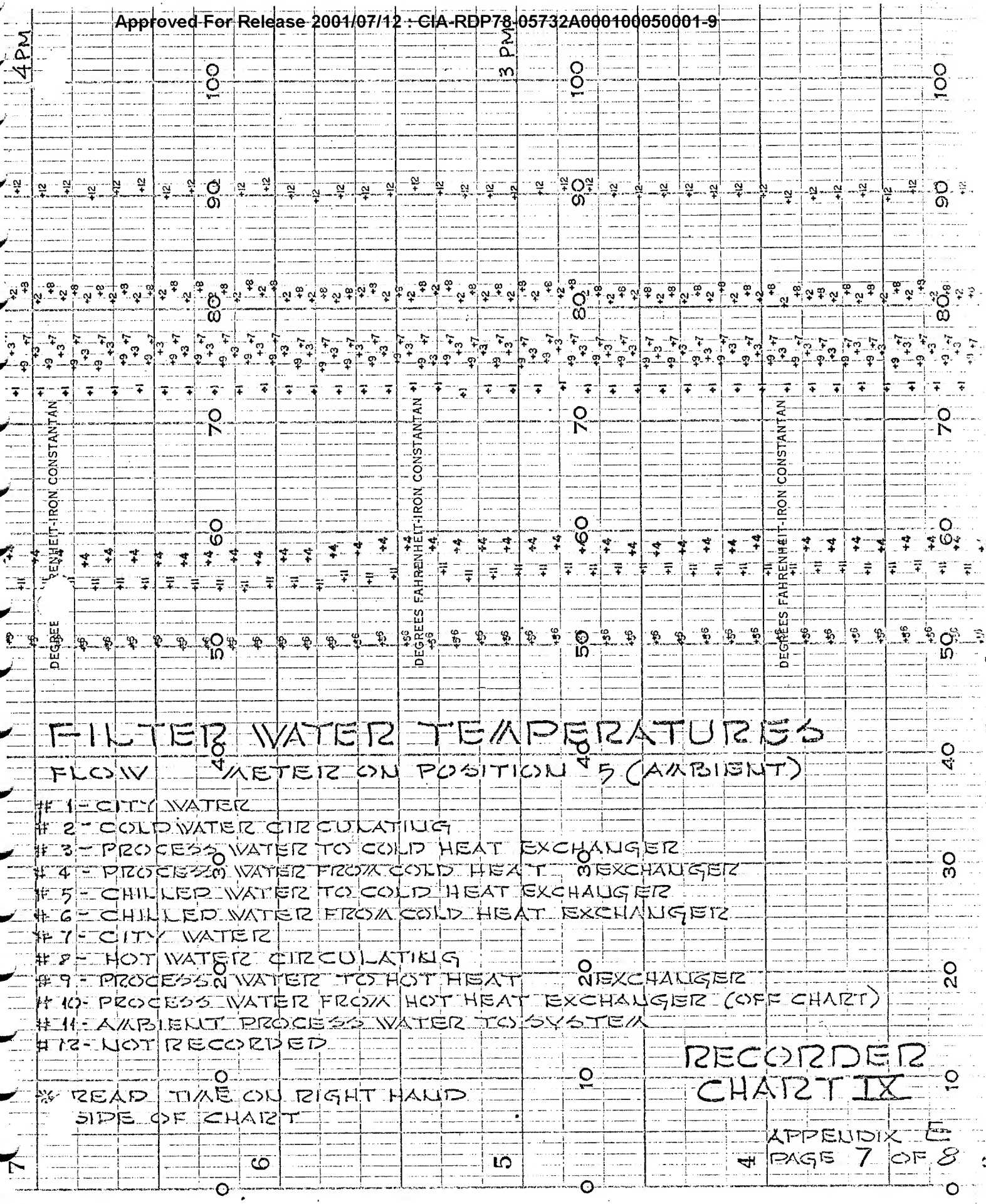
#1- CITY WATER
#2- COLD WATER CIRCULATING
#3- NOT RECORDING
#4- PROCESS WATER FROM COLD HEAT EXCHANGER
#5- CHILLED WATER TO COLD HEAT EXCHANGER
#6- CHILLED WATER FROM COLD HEAT EXCHANGER
#7- CITY WATER
#8- HOT WATER CIRCULATING
#9- PROCESS WATER TO HOT HEAT EXCHANGER
#10- PROCESS WATER FROM HOT HEAT EXCHANGER (OFF CHART)
#11- AMBIENT PROCESS WATER TO SYSTEM
#12- NOT RECORDING

* READ TIME ON RIGHT HAND SIDE OF CHART 8 7

APPENDIX E
PAGE 5 OF 8

1892-24





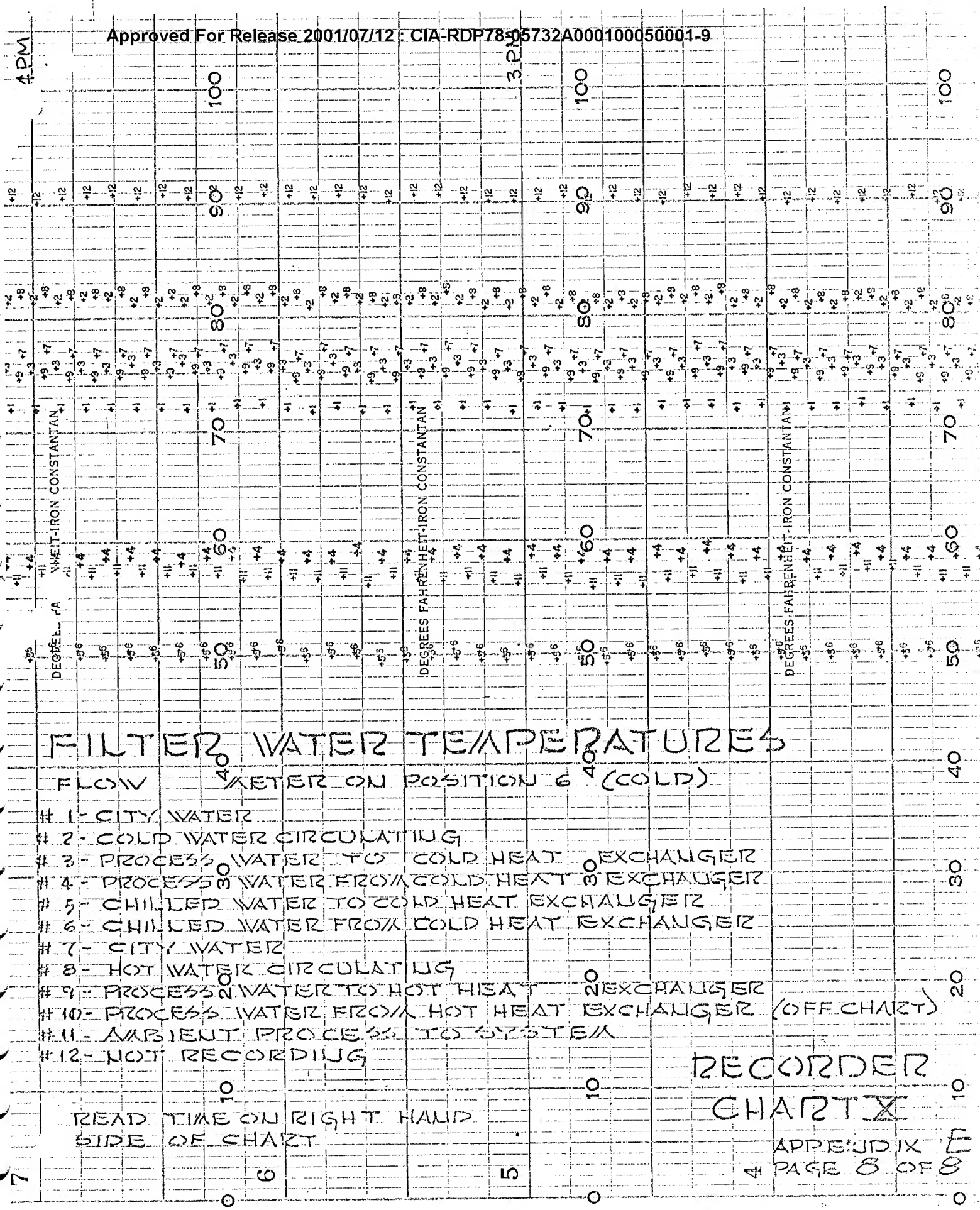
FILTER WATER TEMPERATURES

FLOW METER ON POSITION 5 (AMBIENT)

#1 - CITY WATER
#2 - COLD WATER CIRCULATING
#3 - PROCESS WATER TO COLD HEAT EXCHANGER
#4 - PROCESS WATER FROM COLD HEAT EXCHANGER
#5 - CHILLED WATER TO COLD HEAT EXCHANGER
#6 - CHILLED WATER FROM COLD HEAT EXCHANGER
#7 - CITY WATER
#8 - HOT WATER CIRCULATING
#9 - PROCESS WATER TO HOT HEAT EXCHANGER
#10 - PROCESS WATER FROM HOT HEAT EXCHANGER (OFF CHART)
#11 - AMBIENT PROCESS WATER TO SYSTEM
#12 - NOT RECORDED

* READ TIME ON RIGHT HAND SIDE OF CHART

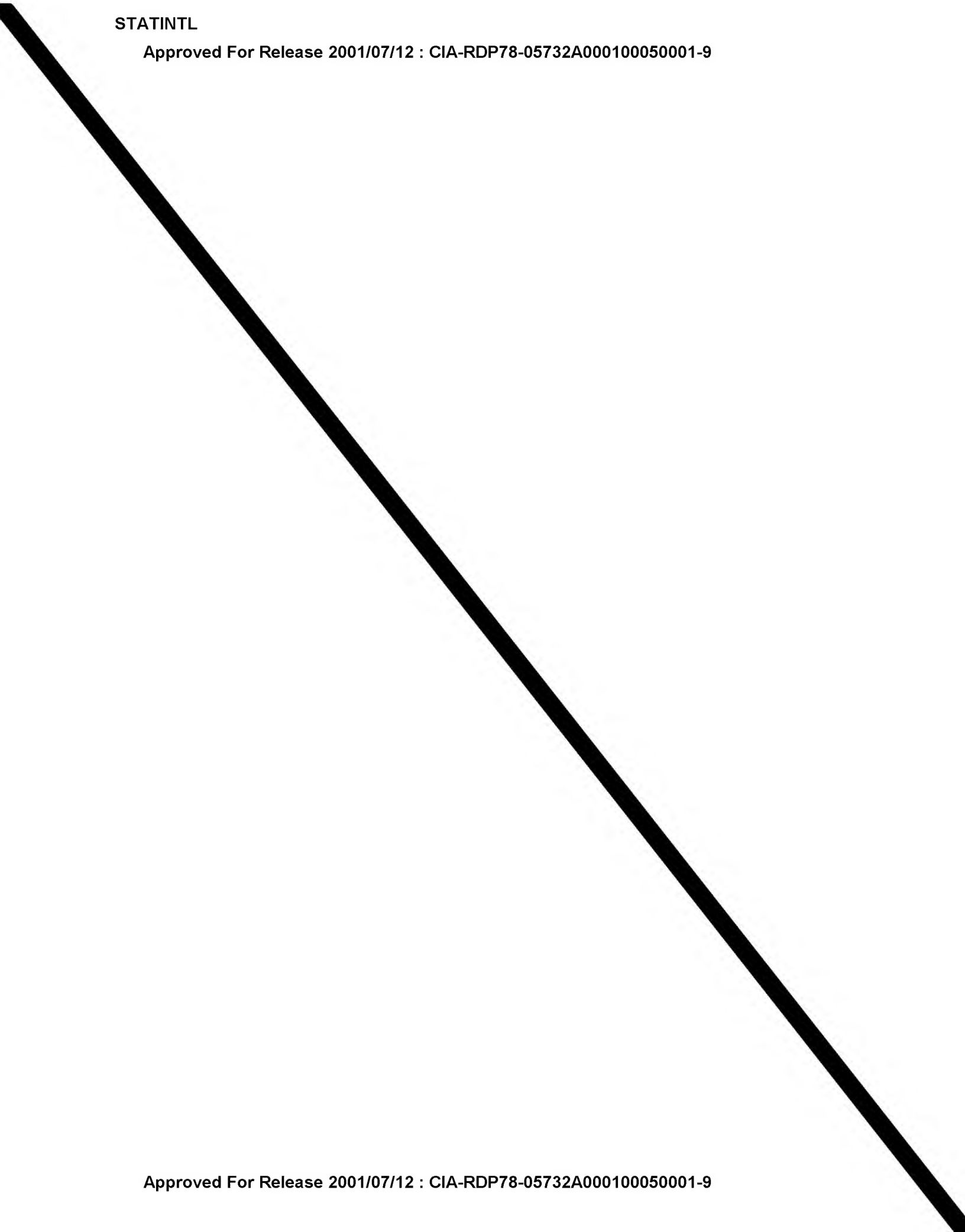
RECORDER CHART IX



SECTION 2

APPENDIX F

The following data was assembled by the [redacted]. They STATINTL subcontracted the labor and instrumentation for the electrical portion of this report.



Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

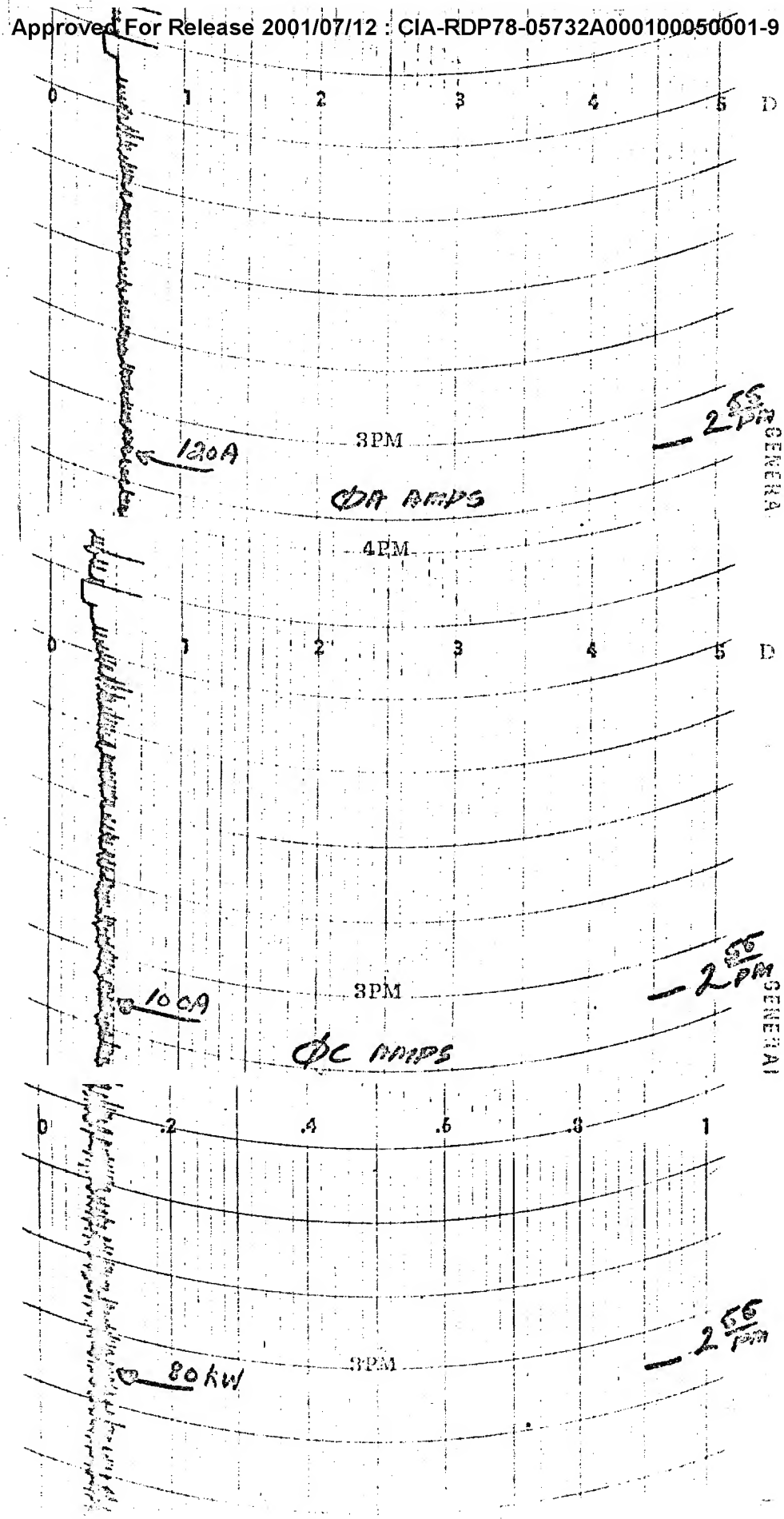
POWER RISER #1 CENTER SHAFT

START 11:00 AM 10/14/68
STOP 10:20 PM 10/17/68

Maximum Amperes ØA:	120A	Time:	2:55 P.M.		
Minimum Amperes ØA:	20A	Time:	1:00 A.M.		
Maximum Amperes ØC:	100A	Time:	2:55 P.M.		
Minimum Amperes ØC:	10A	Time:	1:00 A.M.		
Maximum Watts:	80KW	Time:	2:55 P.M.	PF:	.91
Minimum Watts:	24KW	Time:	1:00 A.M.	PF:	.76

CHARACTERISTICS:

Load picks up at 8:00 A.M., drops off at 4:30 P.M., characterized by heavy motor starting inrush.



POWER RISER #1

CENTER SHAFT

ØA, ØC AMP RECORDINC

3Ø WATT RECORDINGS

POWER RISER #2 CENTER SHAFT

START 3:30 AM 10/9/68
STOP 10:00 AM 10/14/68

Maximum Amperes ØA:	110A	Time:	3:50 P.M.		
Minimum Amperes ØA:	40A	Time:	12:00 Midnight		
Maximum Amperes ØC:	110A	Time:	3:50 P.M.		
Minimum Amperes ØC:	40A	Time:	12:00 Midnight		
Maximum Watts:	80KW	Time:	3:50 P.M.	PF:	.91
Minimum Watts:	24KW	Time:	12:00 Midnight	PF:	.76

CHARACTERISTICS:

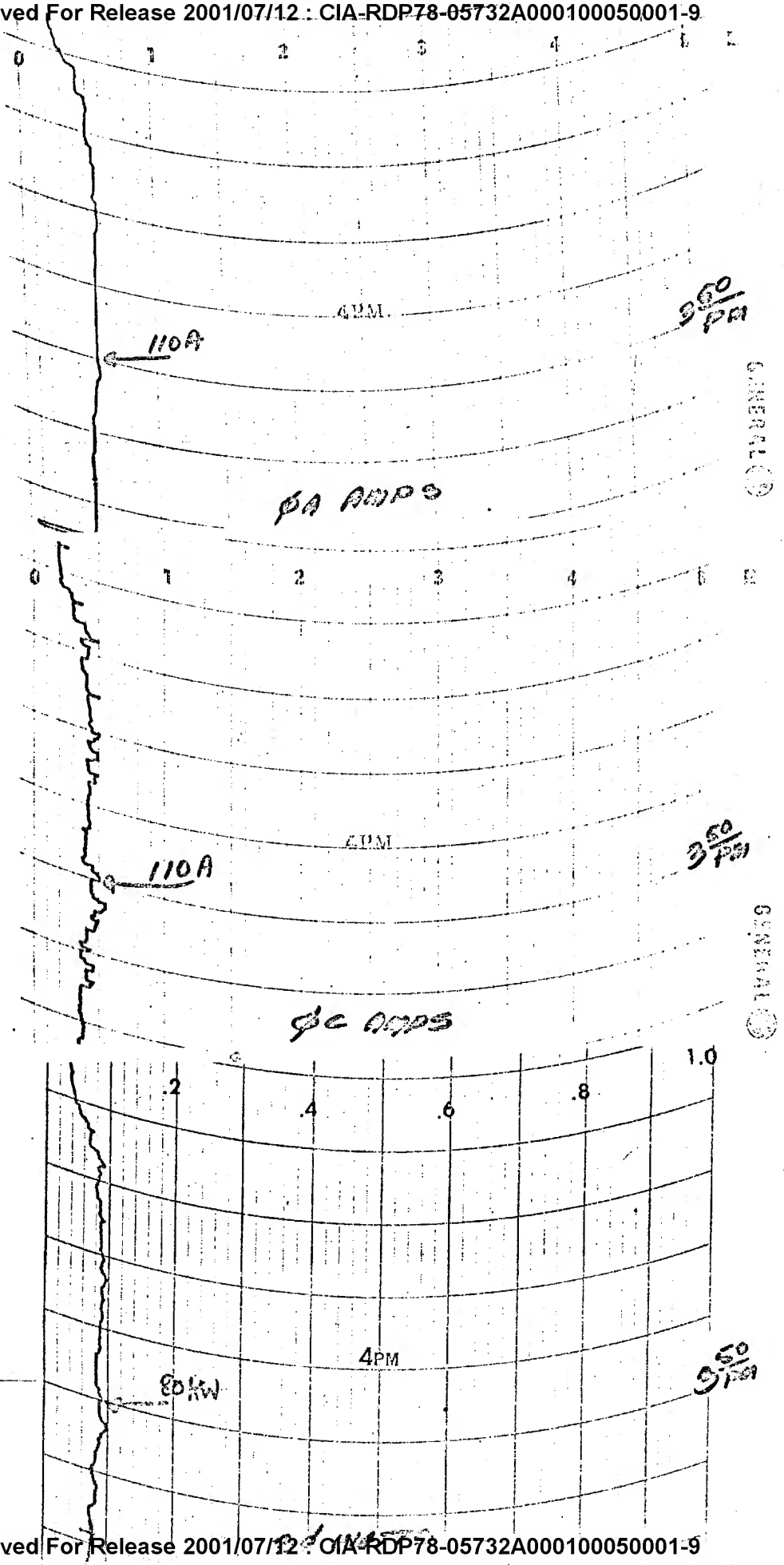
Load is building service. Picks up at 8:00 A.M., drops off at 4:30 P.M. each work day.

POWER RISER #2

CENTER SHAFT

ØA, ØC AMP
RECORDINGS

3Ø WATT RECORDIN



MOTOR CONTROL CENTER #2 EQUIPMENT AREA NORTH END

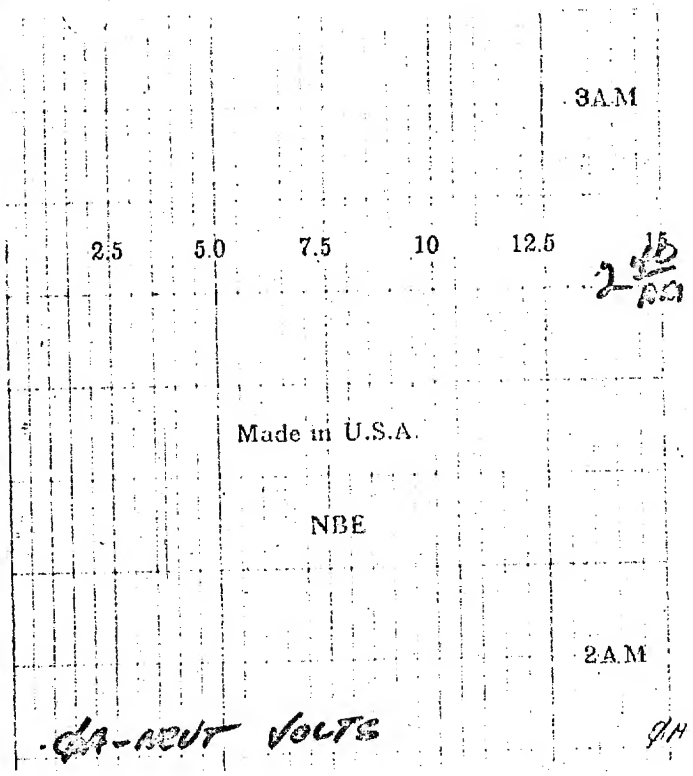
START 12:00 NOON 10/17/68
STOP 8:00 A.M. 10/20/68

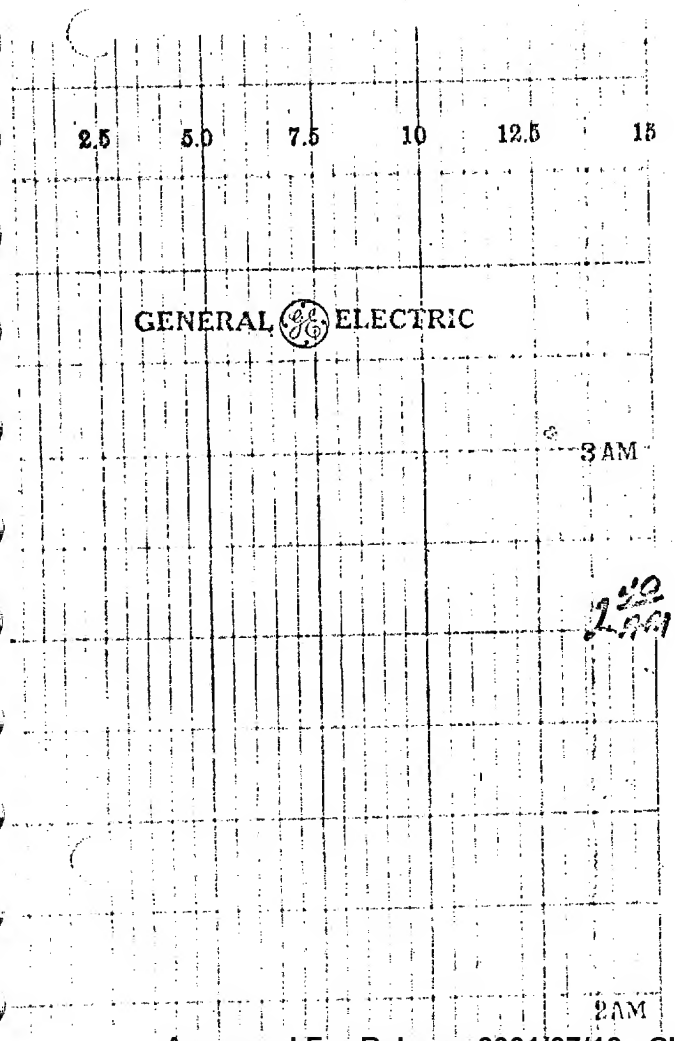
Maximum Amperes ØA:	700A	Time:	2:40 A.M. 10/18/68	
Minimum Amperes ØA:	520A	Time:	7:30 A.M. 10/18/68	
Maximum Amperes ØC:	680A	Time:	2:40 A.M. 10/18/68	
Minimum Amperes ØC:	500A	Time:	7:30 A.M. 10/18/68	
Maximum Watts:	484KW	Time:	2:40 A.M. 10/18/68	PF: .88
Minimum Watts:	360KW	Time:	7:30 A.M. 10/18/68	PF: .89

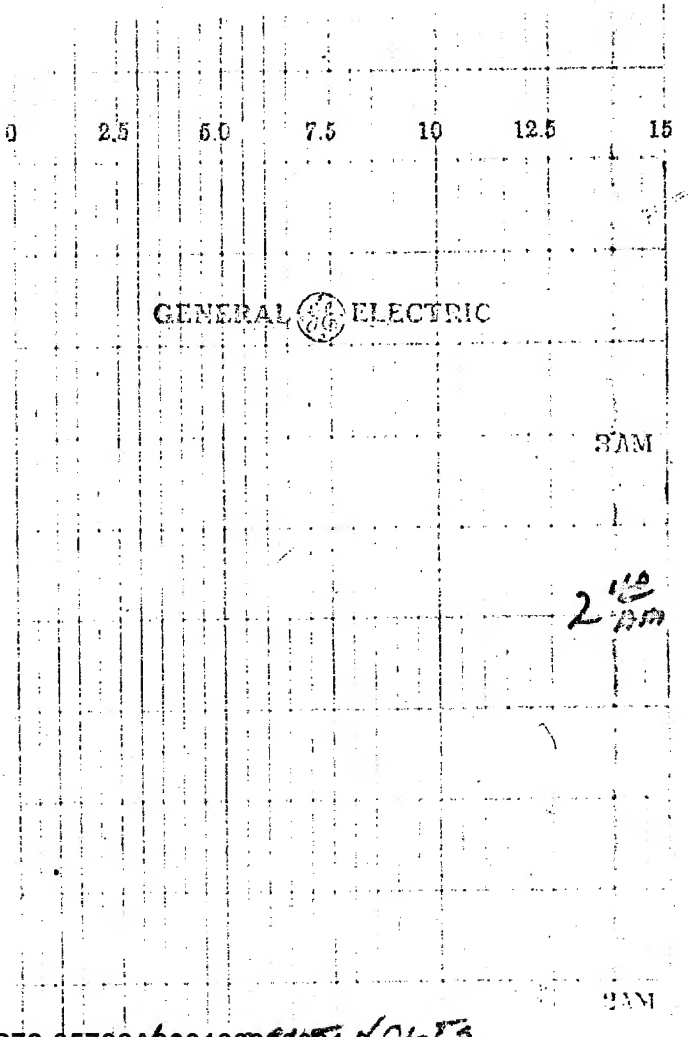
MOTOR CONTROL CENTER

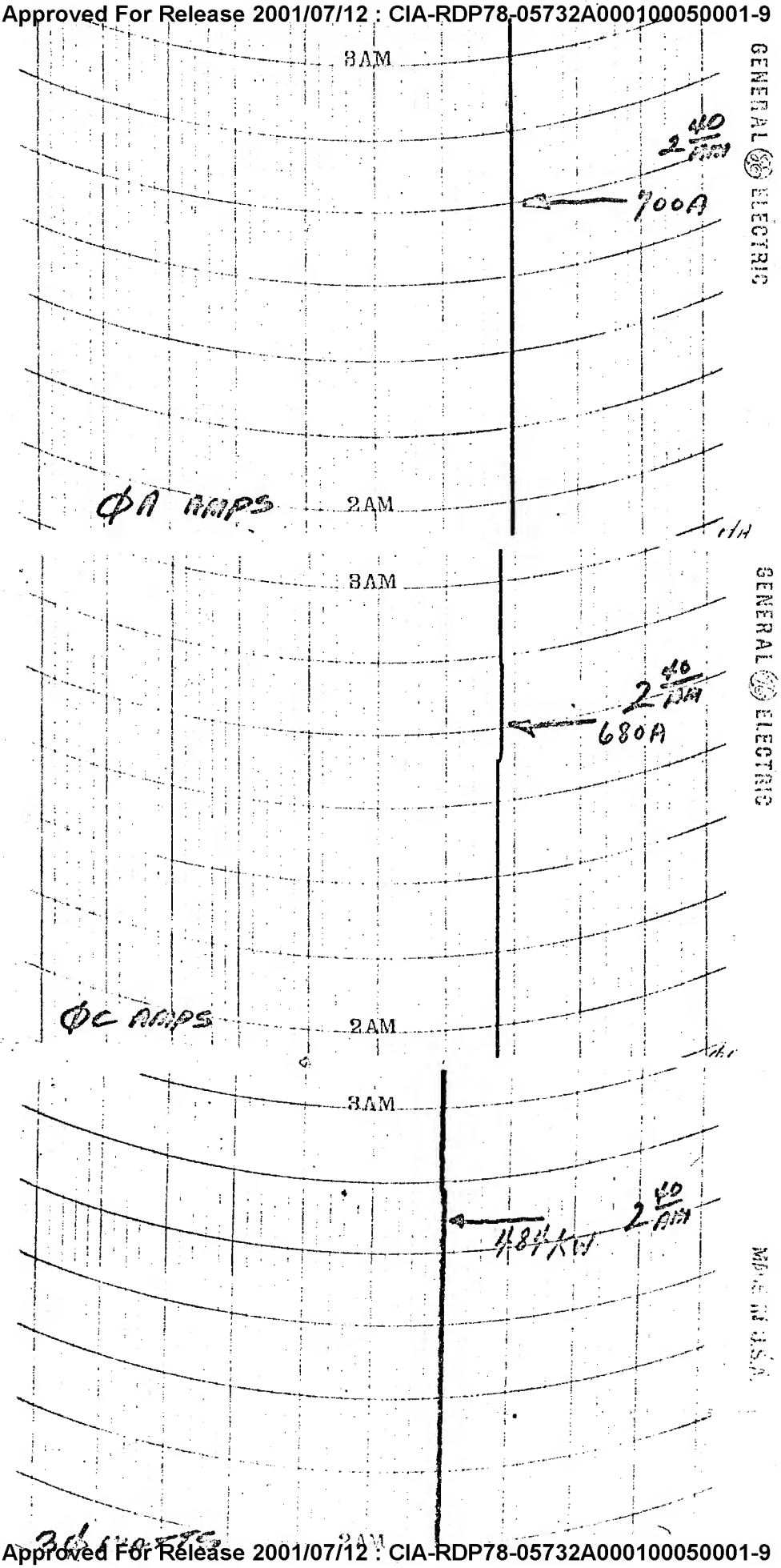
#2 EQUIPMENT AREA NORTH END

Ø - NEUTRAL VOLTAGE RECORDINGS







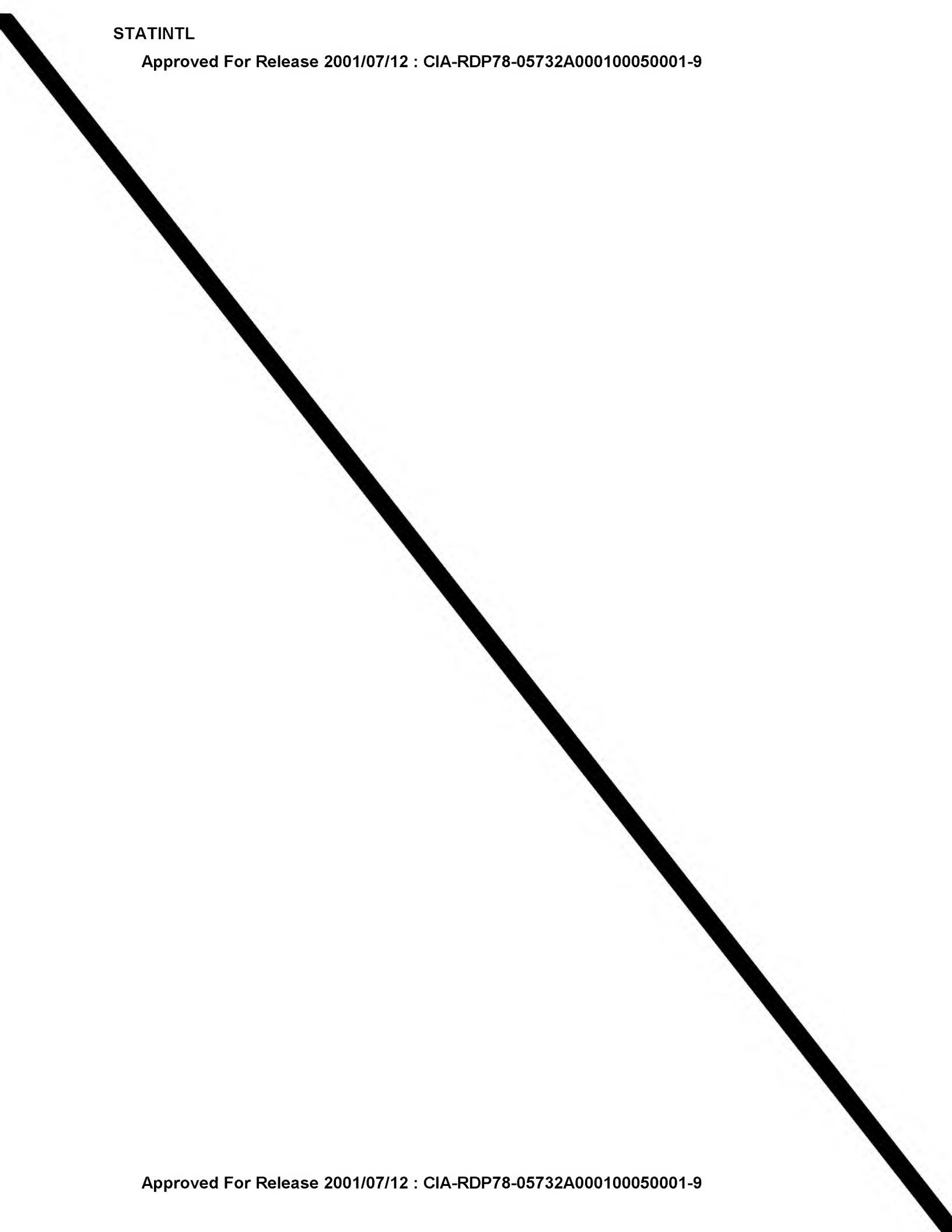


MOTOR CONTROL CENTER

#2 EQUIPMENT AREA
NORTH END

ØA, ØC AMP RECORDING

3Ø WATT RECORDING



POWER RISER #2 CENTER SHAFT

START 3:30 A.M. 10/ 9/68
STOP 10:00 A.M. 10/14/68

Maximum Amperes ØA:	110A	Time:	3:50 P.M.
Minimum Amperes ØA:	40A	Time:	12:00 Midnight
Maximum Amperes ØC:	110A	Time:	3:50 P.M.
Minimum Amperes ØC:	40A	Time:	12:00 Midnight
Maximum Watts:	80KW	Time:	3:50 P.M.
Minimum Watts	24KW	Time:	12:00 Midnight
P.F. at Maximum Watts:		.91	
P.F. at Minimum Watts:		.72	

CHARACTERISTICS:

Load is building service. Picks up at 8:00 A.M., drops off at 4:30 P.M. each work day.

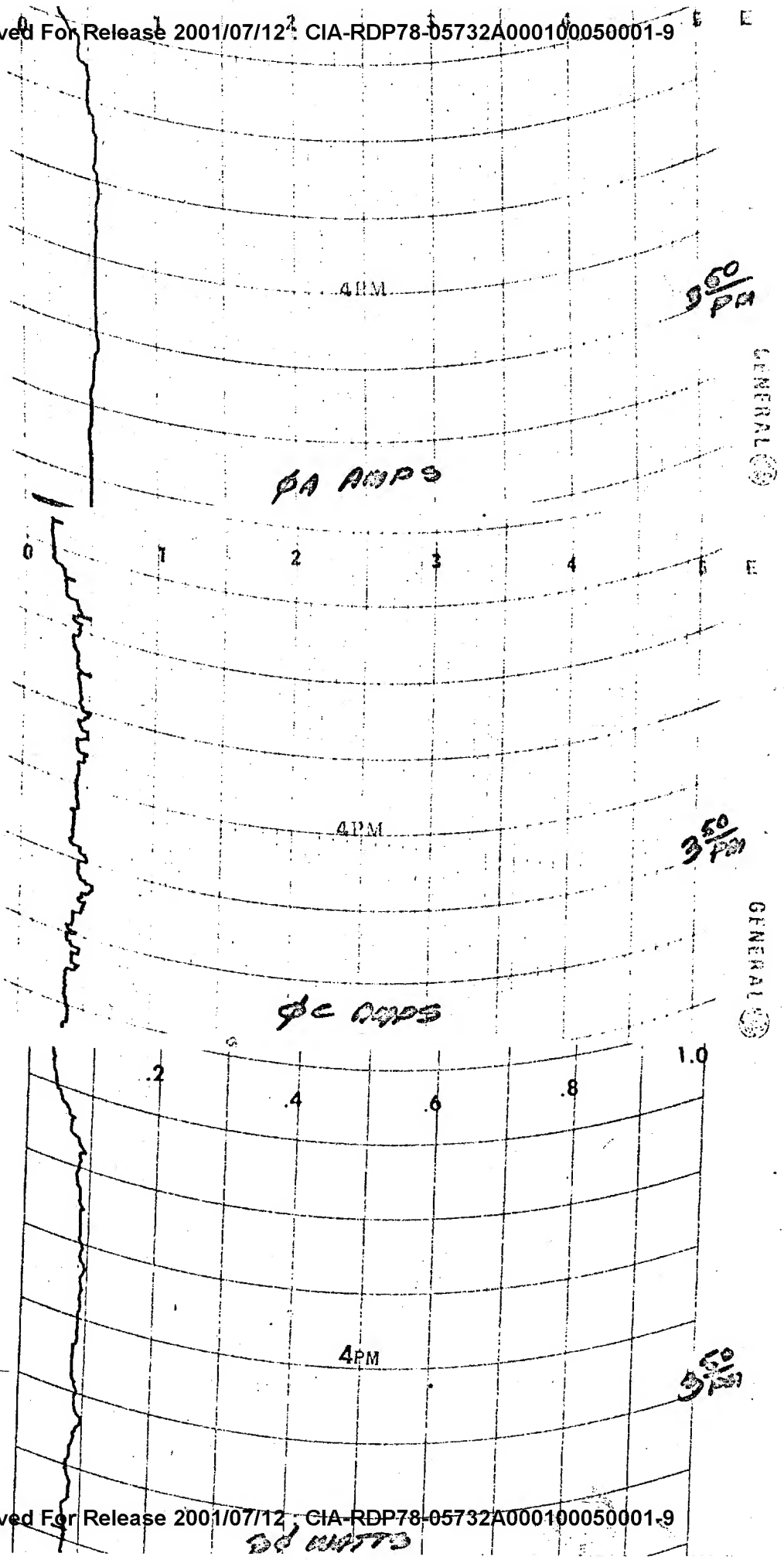
Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

POWER RISER #2

CENTER SHAFT

ØA, ØC AMP
RECORDINGS

3Ø WATT RECORDIN



POWER RISER #1 CENTER SHAFT

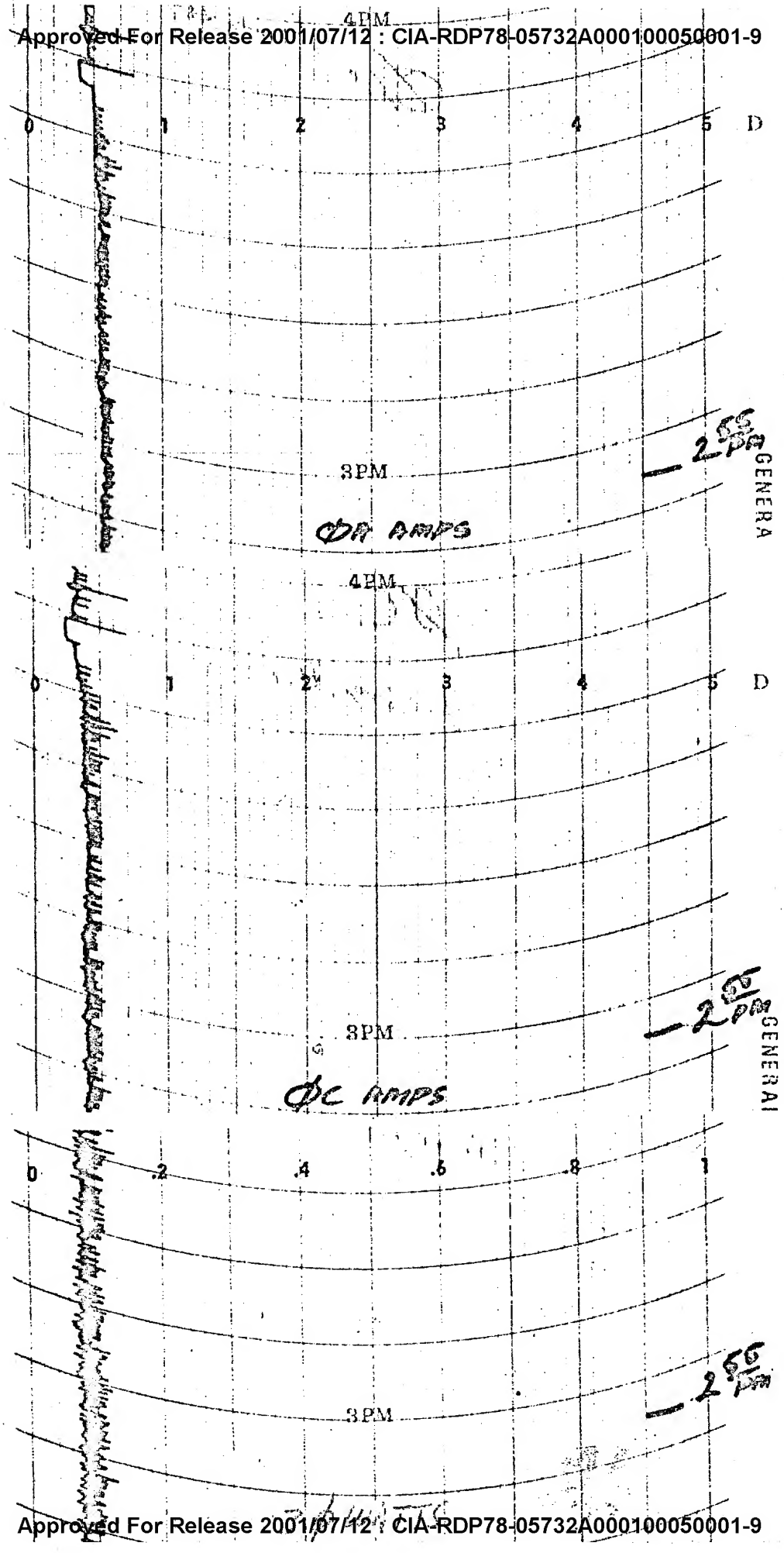
START 10/14/68 11:00 A.M.
STOP 10/17/68 10:20 P.M.

Maximum Amperes ØA:	120A	Time:	2:55 P.M.
Minimum Amperes ØA:	20A	Time:	1:00 A.M.
Maximum Amperes ØC:	100A	Time:	2:55 P.M.
Minimum Amperes ØC:	10A	Time:	1:00 A.M.
Maximum Watts:	80KW	Time:	2:55 P.M.
Minimum Watts:	16KW	Time:	1:00 A.M.
P.F. at Maximum Watts:		.91	
P.F. at Minimum Watts:		.78	

CHARACTERISTICS:

Load picks up at 8:00 A.M., drops off at 4:30 P.M., characterized by heavy motor starting inrush.

Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.



POWER RISER #1

CENTER SHAFT

ØA, ØC AMP RECORDINGS

3Ø WATT RECORDINGS

MOTOR CONTROL CENTER #2 EQUIPMENT AREA NORTH END

START: 12:00 Noon 10/17/68
STOP: 8:00 A.M. 10/20/68

Maximum Amperes ØA:	700A	Time:	2:40 A.M. 10/18/68
Minimum Amperes ØA:	520A	Time:	7:30 A.M. 10/18/68
Maximum Amperes ØC:	680A	Time:	2:40 A.M. 10/18/68
Minimum Amperes ØC	500A	Time:	7:30 A.M. 10/18/68
Maximum Watts:	484KW	Time:	2:40 A.M. 10/18/68
Minimum Watts:	360KW	Time:	7:30 A.M. 10/18/68
P.F. at Maximum Watts:		.86	
P.F. at Minimum Watts:		.85	

CHARACTERISTICS:

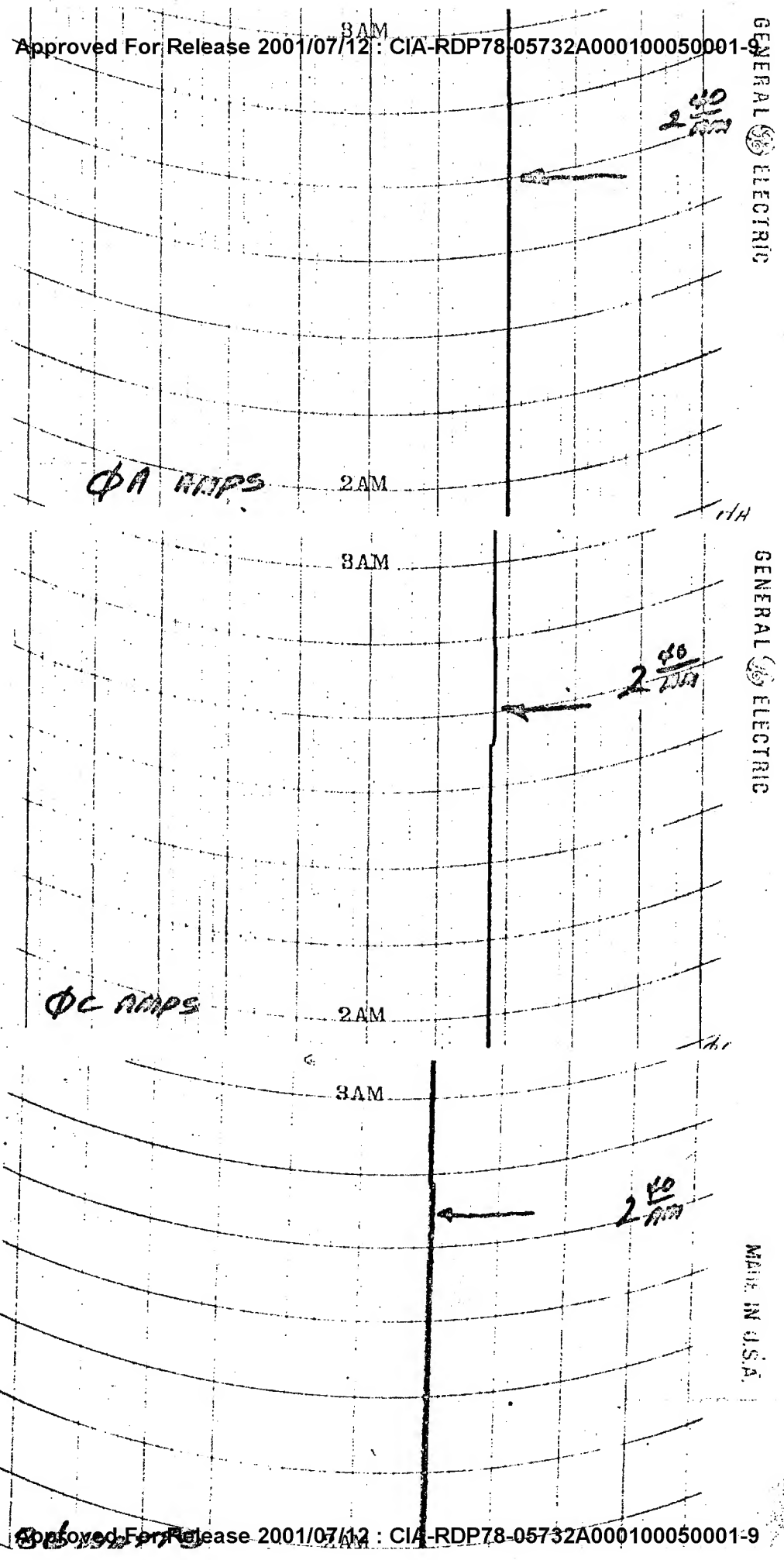
Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

MOTOR CONTROL CENTER

#2 EQUIPMENT AREA
NORTH END

ØA, ØC AMP RECORDING

3Ø WATT RECORDING



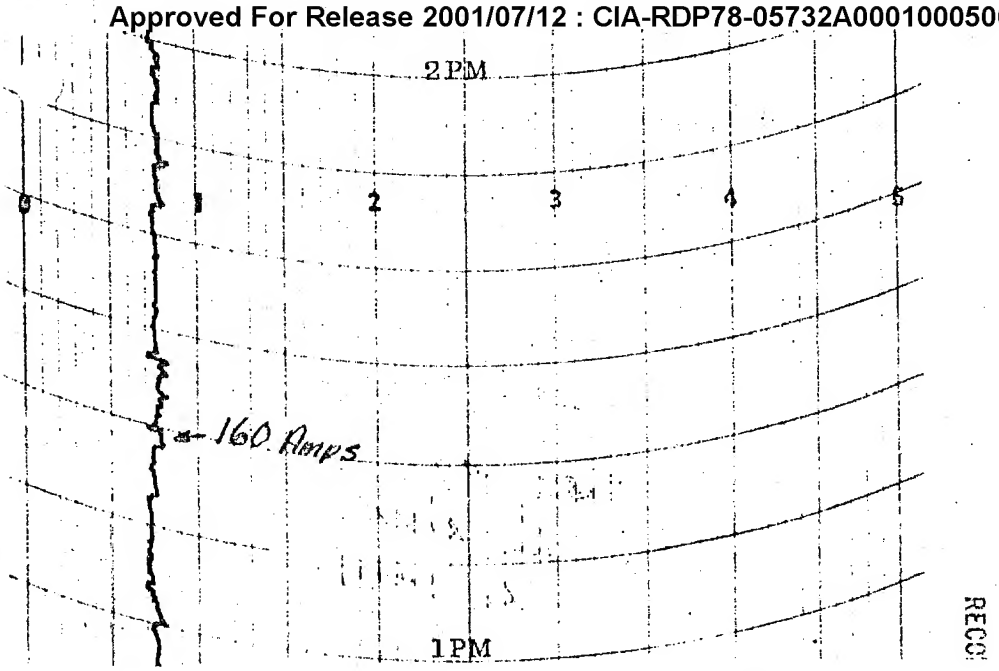
SUBSTATION #1 POWER RISER, NORTH SHAFT

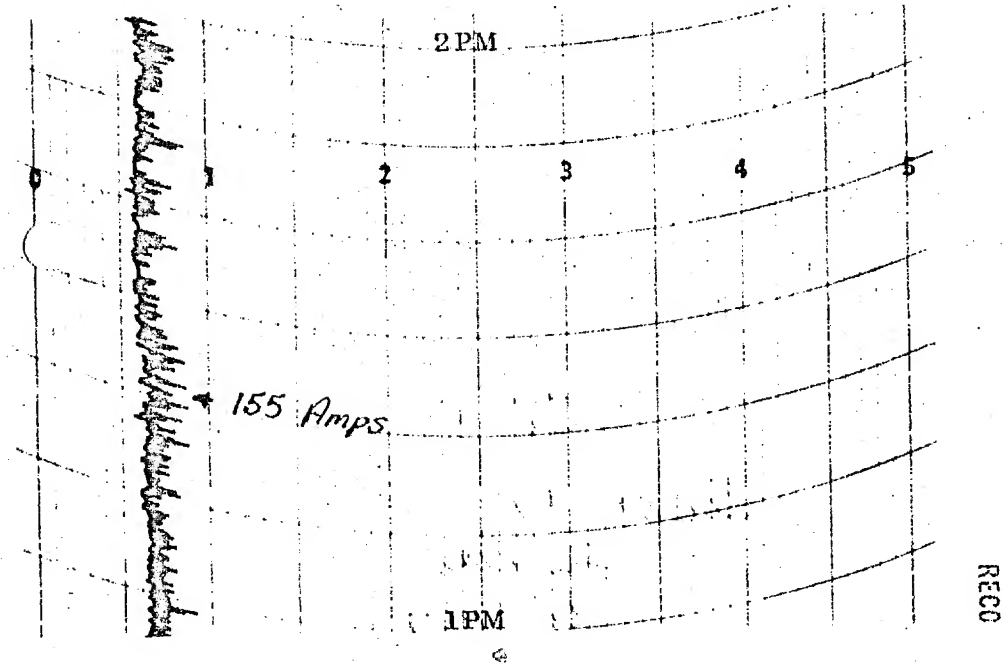
START: 8:00 P.M. 10/20/68
STOP: 6:00 P.M. 10/23/68

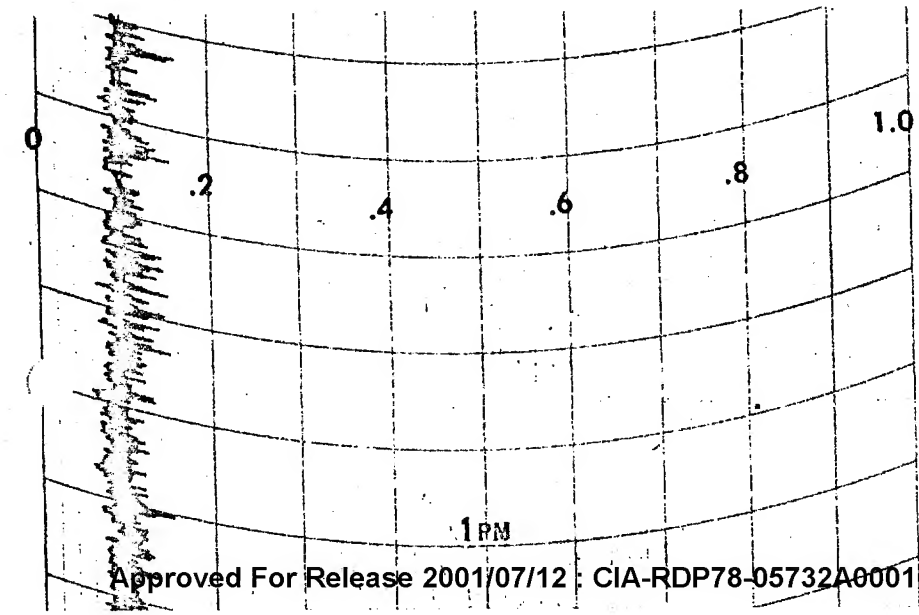
Maximum Amperes ØA	160A	Time:	1:20 P.M.
Minimum Amperes ØA	50A	Time:	1:00 A.M.
Maximum Amperes ØC	155A	Time:	1:20 P.M.
Minimum Amperes ØC	35A	Time:	1:00 A.M.
Maximum Watts:	96KW	Time:	1:20 P.M.
Minimum Watts:	24KW	Time:	1:00 A.M.
P.F. at Maximum Watts:		.76	
P.F. at Minimum Watts:		.69	

CHARACTERISTICS:

Load picks up at 7:30 A.M., continues until approximately 4:30 P.M. Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.







SUBSTATION #1
NORTH SHAFT POWER RISER

ØA, ØC Amp Recordings

3Ø Watt Recordings

PRINTED IN U.S.A.

SUBSTATION #1 LIGHTING RISER NORTH SHAFT

START: 8:00 P.M. 10/23/68
STOP: 8:00 P.M. 10/28/68

Maximum Amperes ØA	530A	Time:	2:00 P.M.
Minimum Amperes ØA	80A	Time:	2:00 A.M.
Maximum Amperes ØC	490A	Time:	2:00 P.M.
Minimum Amperes ØC	58A	Time:	2:00 A.M.
Maximum Watts:	405KW	Time:	2:00 P.M.
Minimum Watts:	54KW	Time:	2:00 A.M.
P.F. at Maximum Watts:		.96	
P.F. at Minimum Watts:		.92	

CHARACTERISTICS:

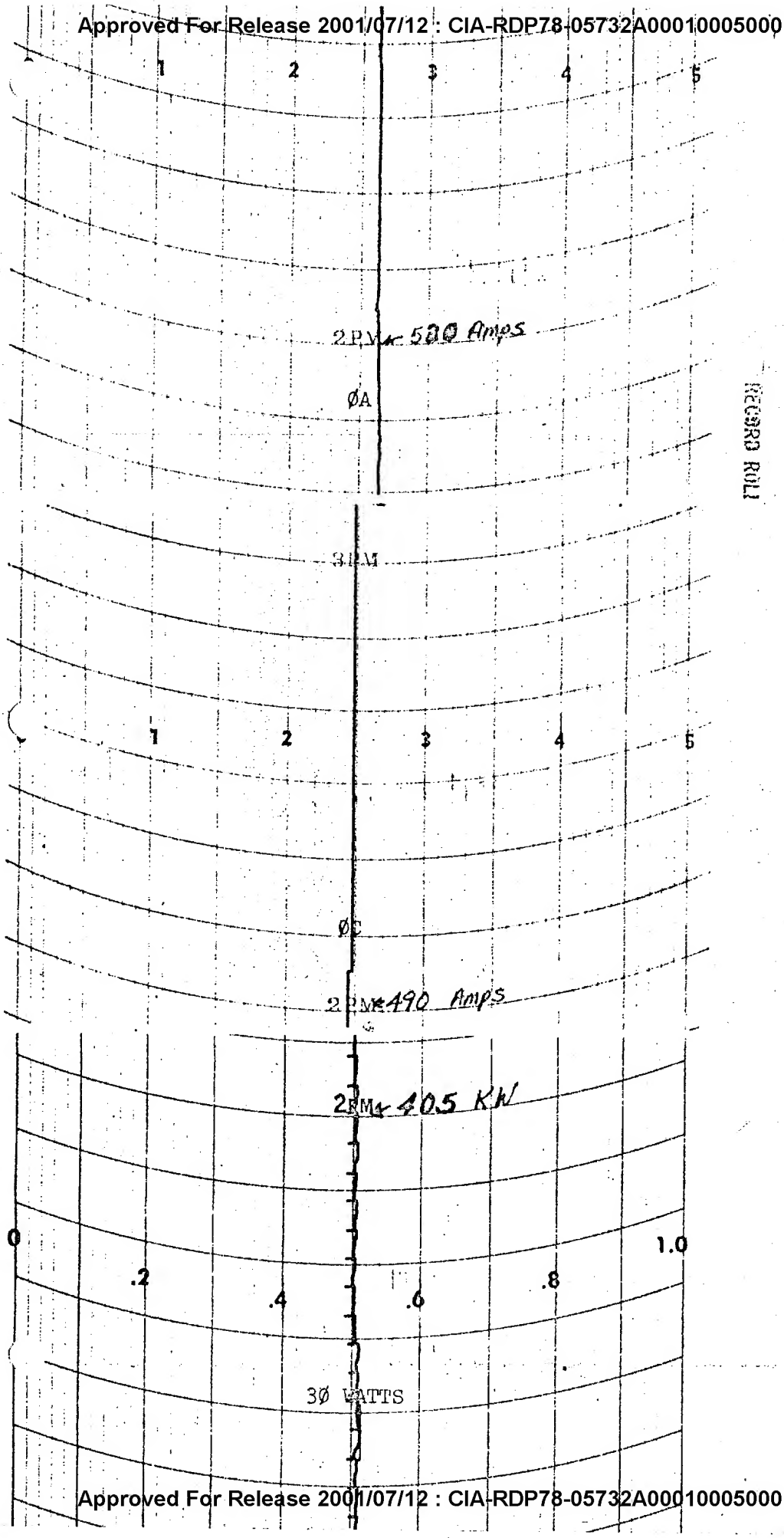
Load picks up at 8:00 A.M., continues until approximately 6:00 P.M.

Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

SUBSTATION #1
LIGHTING RISER
NORTH SHAFT

ØA, ØC Amp Recordin

3Ø Watt Recordings



SUBSTATION #1 MCC #1 EQUIPMENT AREA, NORTH END

START: 10:00 P.M. 10/28/68
STOP: 6:00 P.M. 10/31/68

Maximum Amperes ØZ	480A	Time:	1:50 P.M.
Minimum Amperes ØA	460A	Time:	3:20 A.M.
Maximum Amperes ØC	490A	Time:	1:50 P.M.
Minimum Amperes ØC	460A	Time:	3:20 A.M.
Maximum Watts:	352KW	Time:	1:50 P.M.
Minimum Watts:	336KW	Time:	3:20 A.M.
P.F. at Maximum Watts:		.91	
P.F. at Minimum Watts:		.89	

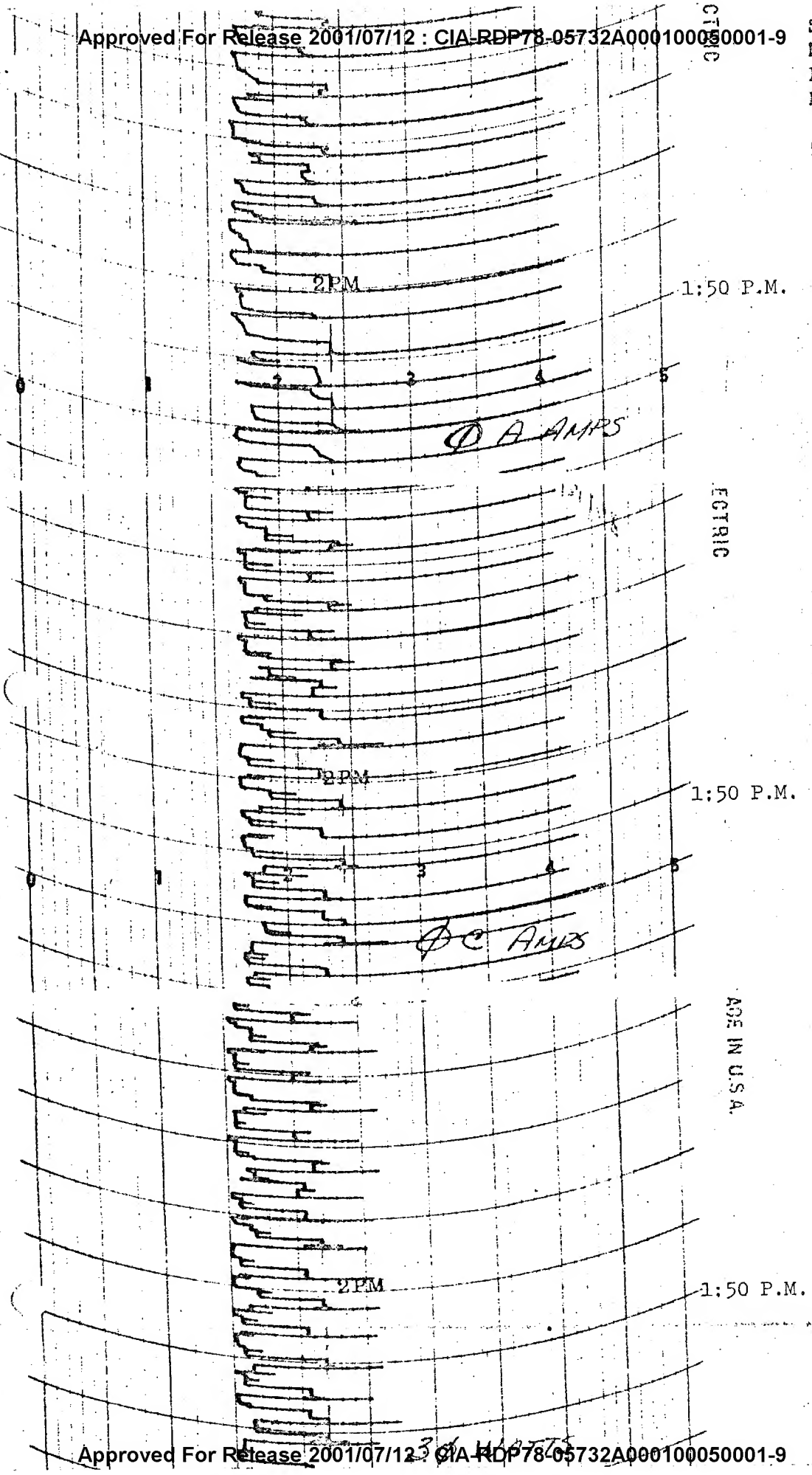
CHARACTERISTICS:

Load remained constant throughout recording period, characterized by heavy motor starting inrush currents. Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

SUBSTATION #1
MCC #1
EQUIPMENT AREA
NORTH END

ØA, ØC Amp Recordings

3Ø Watt Recordings



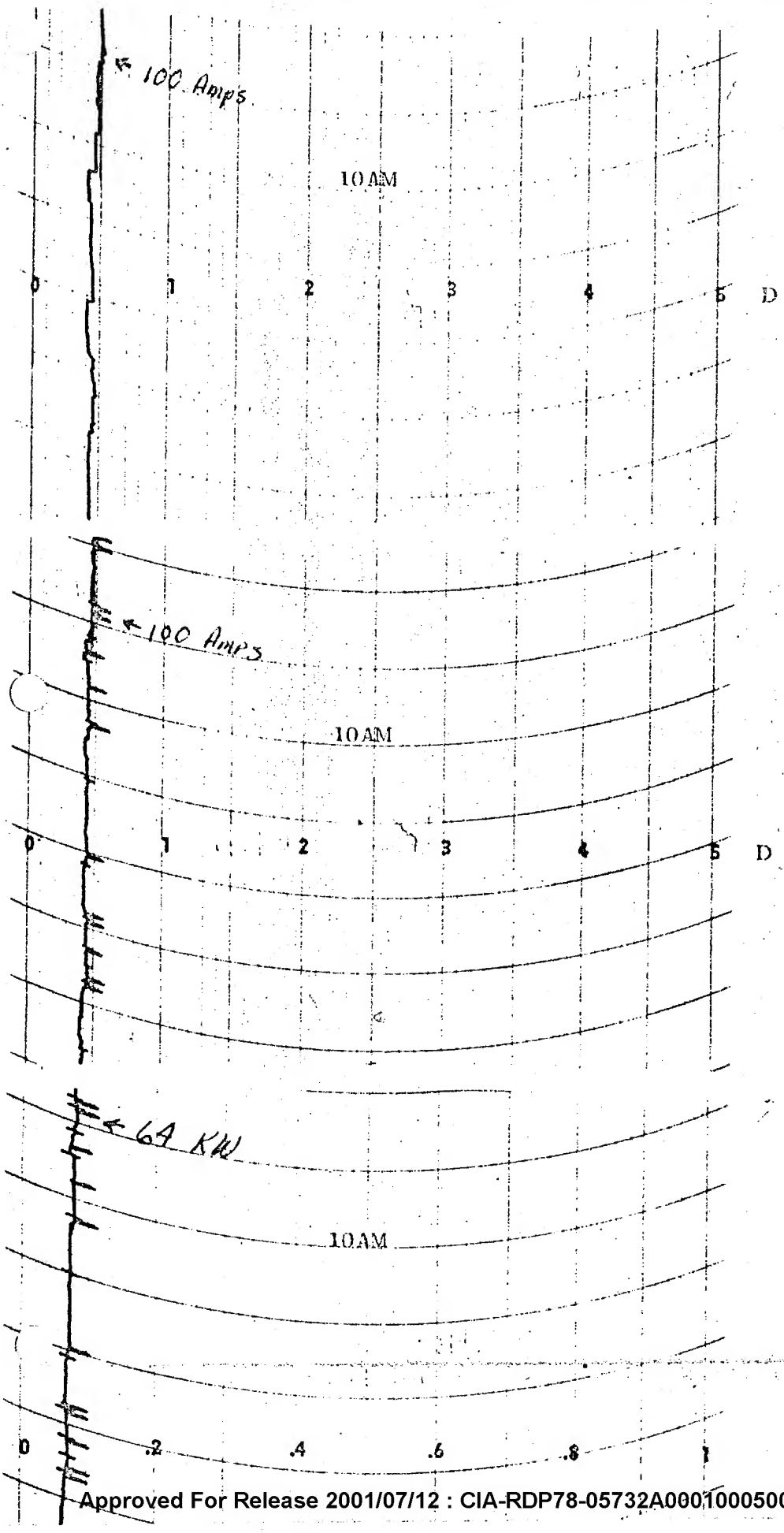
SUBSTATION #3 SOUTH, POWER RISER SOUTH SHAFT

START: 8:00 P.M. 10/31/68
STOP: 5:00 P.M. 11/ 6/68

Maximum Amperes ØA	100A	Time:	10:10 A.M.
Minimum Amperes ØA	35A	Time:	6:30 P.M.
Maximum Amperes ØC	100A	Time:	10:10 A.M.
Minimum Amperes ØC	35A	Time:	6:30 P.M.
Maximum Watts:	64KW	Time:	10:10 A.M.
Minimum Watts:	16KW	Time:	6:30 P.M.
P.F. at Maximum Watts:		.80	
P.F. at Minimum Watts:		.55	

CHARACTERISTICS:

Load picks up at 7:00 A.M., continues until approximately 3:30 P.M. Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.



SUBSTATION #3
POWER RISER SOUTH SHAFT
SOUTH AREA

ØA, ØC Amp Recordings

3Ø Watt Recordings

SUBSTATION #3 SOUTH MCC #3 EQUIPMENT AREA

START: 11/6/68 7:00 A.M.
STOP: 11/9/68 1:00 P.M.

Maximum Amperes ØA	640A	Time:	10:50 A.M.
Minimum Amperes ØA	460A	Time:	9:00 A.M.
Maximum Amperes ØC	630A	Time:	10:50 A.M.
Minimum Amperes ØC	470A	Time:	9:00 A.M.
Maximum Watts:	465KW	Time:	10:50 A.M.
Minimum Watts:	332KW	Time:	9:00 A.M.
P.F. at Maximum Watts:		.91	
P.F. at Minimum Watts:		.88	

CHARACTERISTICS:

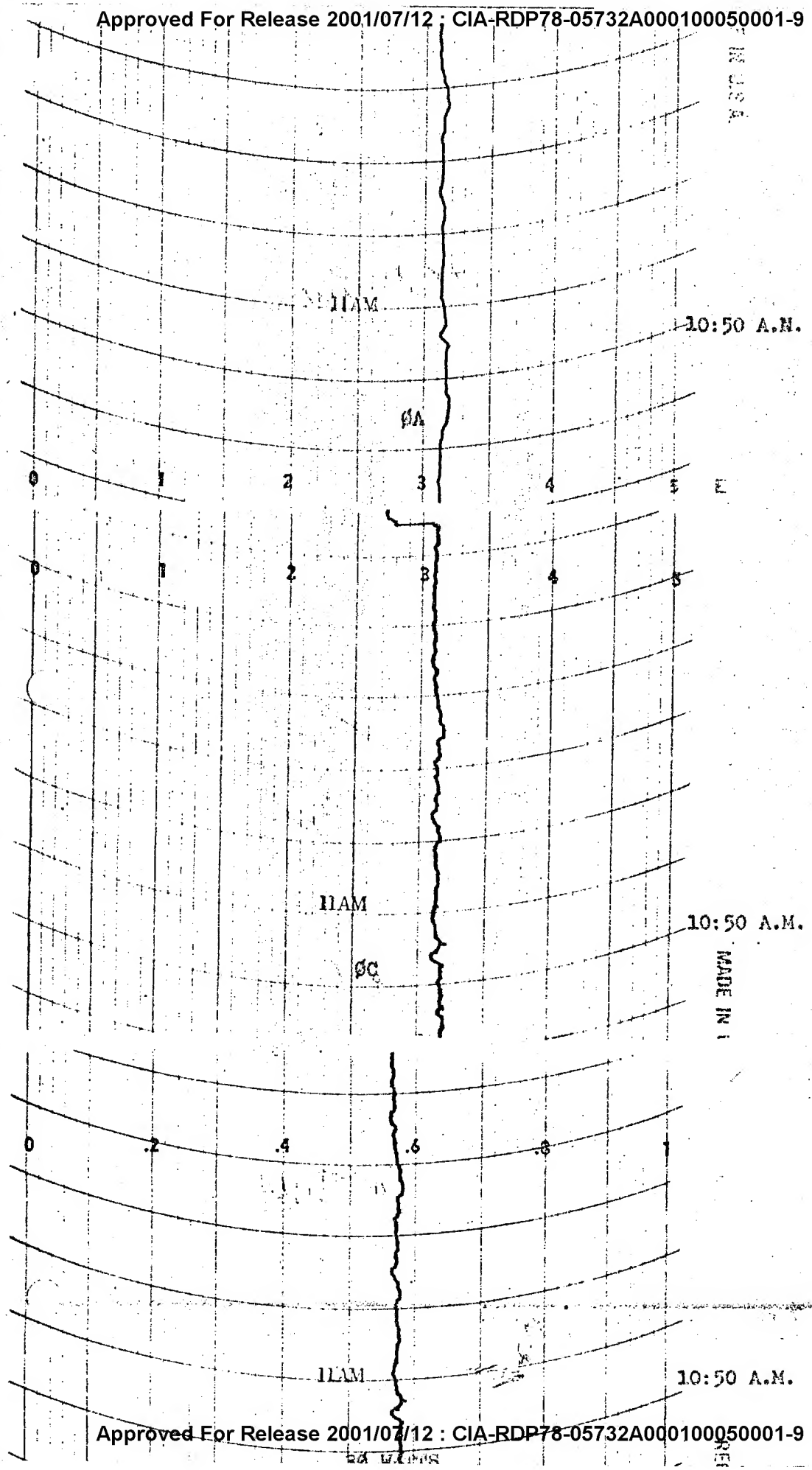
Load remains constant, reasonably, over twenty-four period for entire recording period.

Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

SUBSTATION #3 SOUTH
MCC #3
EQUIPMENT AREA

ØA, ØC Amp Recordings

3Ø Watt Recordings



SUBSTATION #3 SOUTH LIGHTING RISER, SOUTH SHAFT

START: 4:00 P.M. 11/ 9/68
STOP: 6:00 P.M. 11/14/68

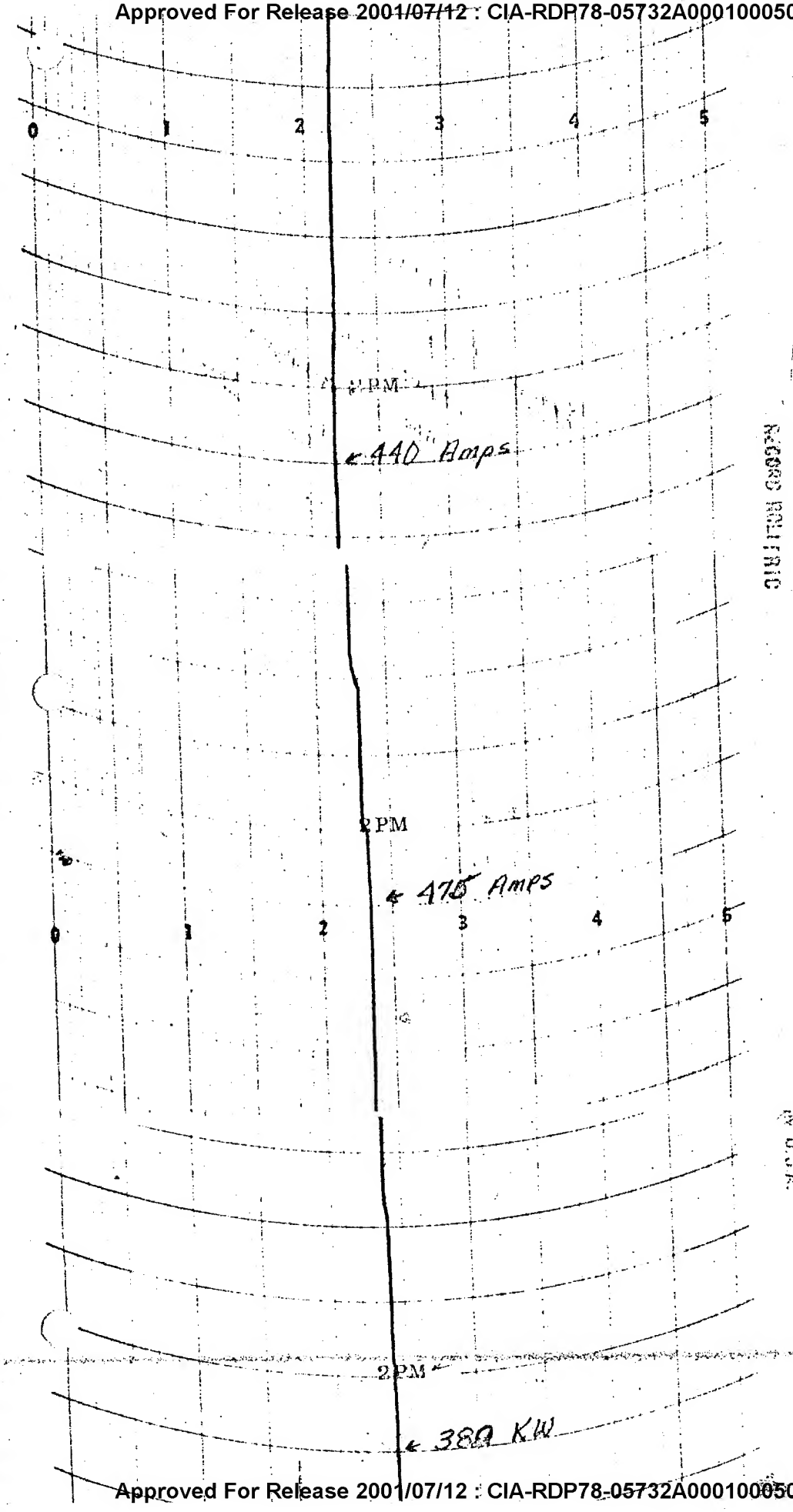
Maximum Amperes ØA	440A	Time:	1:50 P.M.
Minimum Amperes ØA	30A	Time:	3:00 A.M.
Maximum Amperes ØC	475A	Time:	1:50 P.M.
Minimum Amperes ØC	40A	Time:	3:00 A.M.
Maximum Watts:	380KW	Time:	1:50 P.M.
Minimum Watts:	28KW	Time:	3:00 A.M.
P.F. at Maximum Watts:		.99	
P.F. at Minimum Watts:		.97	

CHARACTERISTICS:

Load picks up at 7:30 A.M., continues until approximately 4:30 P.M. Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

SUBSTATION #3
SOUTH LIGHTING RISER
SOUTH SHAFT

ØA, ØC Amp Recordings
3Ø Watt Recordings



SUBSTATION #3 SOUTH AREA MOTOR FEEDER

START: 7:00 P.M. 11/14/68
STOP: 12:00 P.M. 11/21/68

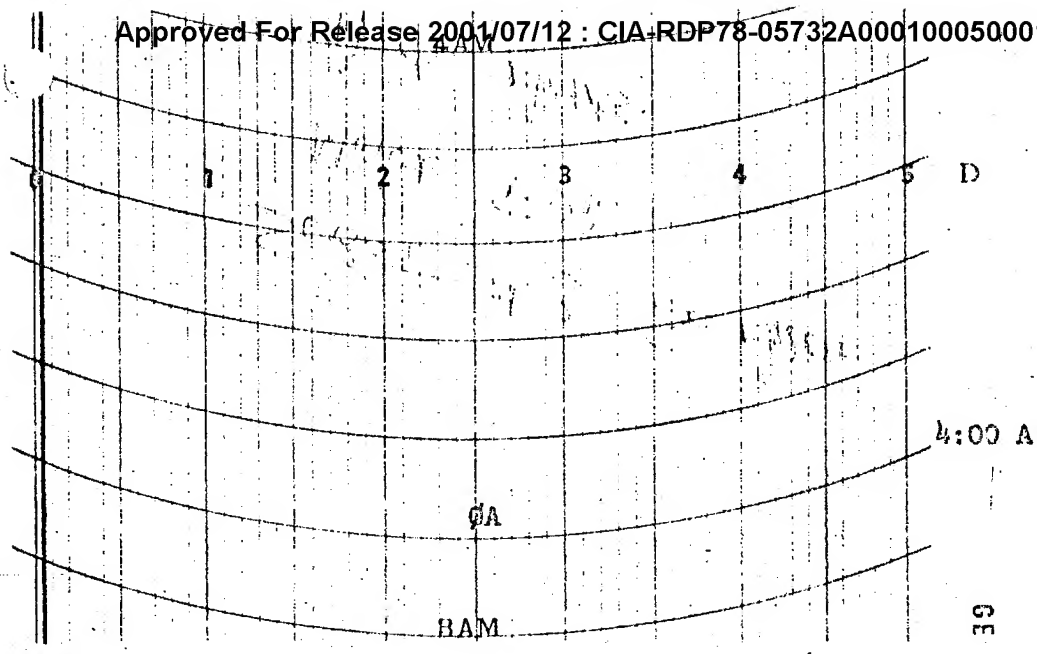
Maximum Amperes ØA	10A	Time:	4:00 A.M.
Minimum Amperes ØA	10A	Time:	2:00 P.M.
Maximum Amperes ØC	12A	Time:	4:00 A.M.
Minimum Amperes ØC	7A	Time:	2:00 P.M.
Maximum Watts:	8KW	Time:	4:00 A.M.
Minimum Watts:	6KW	Time:	2:00 P.M.
P.F. at Maximum Watts:		.91	
P.F. at Minimum Watts:		.86	

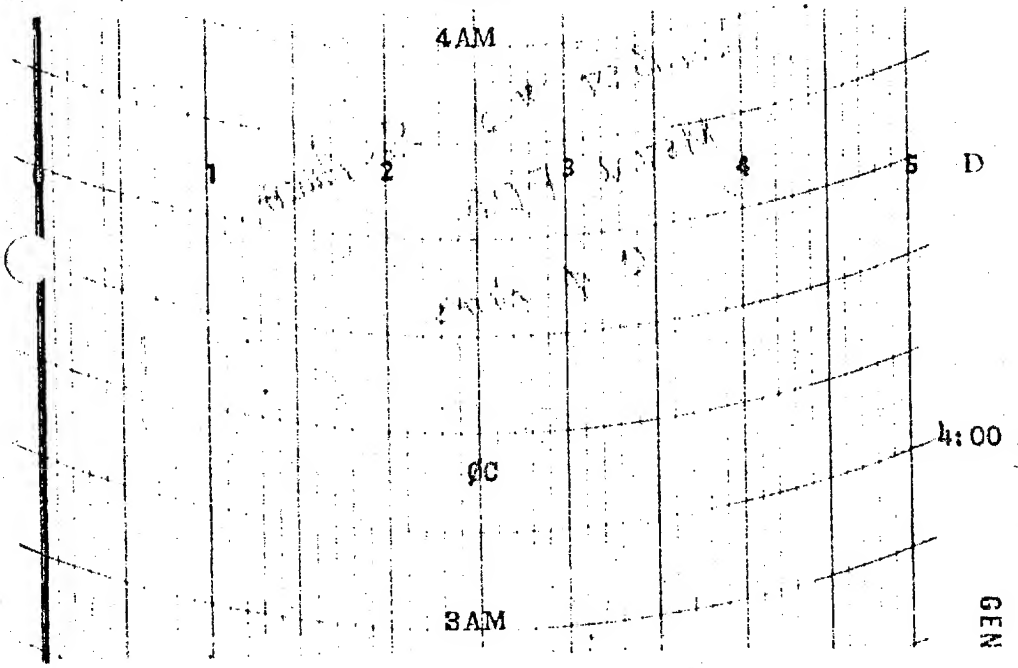
CHARACTERISTICS:

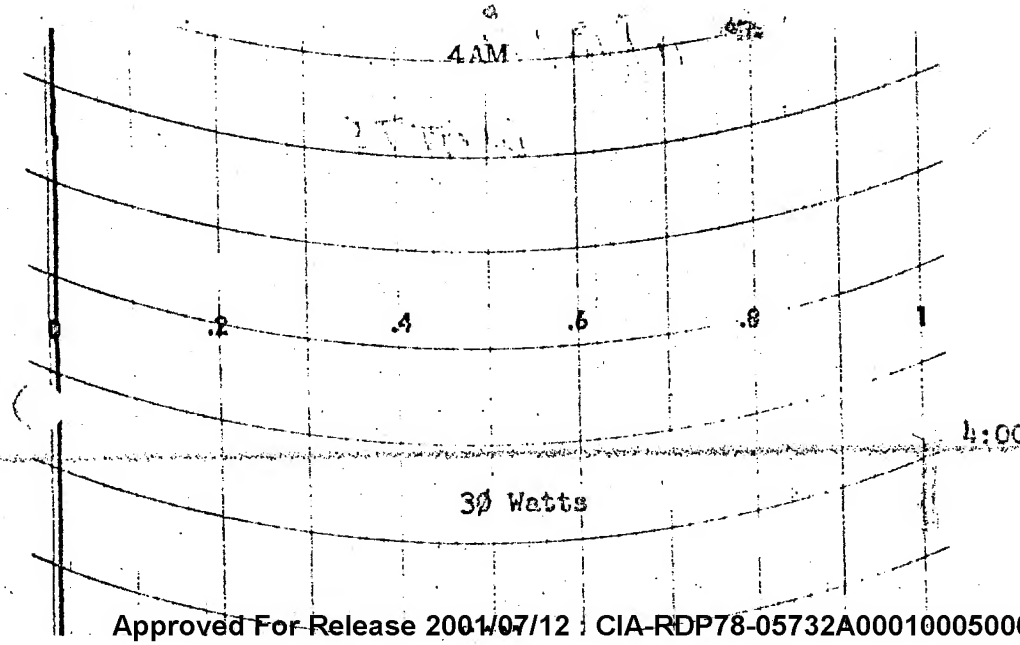
Load extremely light and constant over recording period. Line voltage spread is from approximately 460 volt minimum to 475 volt maximum. Voltage drop is normally experienced on or about 8:00 A.M. to 8:30 A.M. Subsequently, voltage rise is normally experienced on or about 4:30 P.M. Varying degrees of voltage drop is also experienced during other than normal work hours whenever manufacturing processes are in operation.

SUBSTATION #3
SOUTH AREA MOTOR FEEDER
ØA, ØC Amp Recordings

3Ø Watt Recordings







SECTION 2

APPENDIX G

The following pages constitute typical Standard GSA Maintenance Guides.

A-11 AIR HANDLING UNIT

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
Pull and tag safety switch.
See Crafts Handbook, chapts 4 and 5.
Review manufacturer's instructions.

TOOLS:
Portable vacuum
Lubricants and equipment

CHECK POINTS:
1. Examine structure, air passages, dampers, louvers, screens, filter and frame, spray piping, nozzles, pans, drains, insulation, etc.
2. Clean thoroughly, remove dirt, rust, build-up, etc.
3. Examine pump, piping and sprays.

NOTE: Condition of bearings, shaft packing gland, valves, etc. Repack if required.

Frequency A
Avg. time for:
Up to 5000cfm
5000 to 15000 cfm
Over 15000 cfm

CHECK POINTS:
4. Clean and examine motor and controls, check bearings.
5. Vacuum or blow out motor windings.
6. Check over fan, structure, bearings, belts, etc.
7. Comply with lubrication schedule.
8. Paint or touch-up as required.
9. Install filter. (Except roll type.)
10. Operate to test all components.
11. Check chemical treatment equipment, if used.
12. Report any needed work.
13. Clean up area and equipment.
14. Inspect and/or test devices or controls used to protect against freezing.

A-11 AIR HANDLING UNIT

A-12 AIR OUTLETS, CEILING DIFFUSERS, WALL AND CEILING GRILLS, REGISTERS

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.

TOOLS:
Portable vacuum
Cleaning equipment
Ladder of proper size
Powdered Graphite and Puff-box applicator

CHECK POINTS:
1. Vacuum off or remove dirt.
2. Wipe clean.
3. Inspect unit, noting levers, deflectors and adjustable parts. Do not change adjustment.
4. Check connection to duct or throat-piece for any way air may leak out.
5. Lubricate joints with powdered graphite, wipe off excess.
6. Report any defects.

Frequency A
Avg. time:
10000 sq. ft. (net) = 8 hrs.

CHECK POINTS: (continued)
7. Clean up any dirt in room resulting from cleaning the air outlets.

NOTE:
This card applies to locations where cleaning air outlets is done by helpers from the shop. If it is done by the cleaning force the work should be included in the cleaning schedule.

A-12 AIR OUTLETS, CEILING DIFFUSERS, WALL AND CEILING GRILLS, REGISTERS

Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapts. 4 and 5.
Review manufacturer's instructions.

TOOLS:
Replacement filters
Portable vacuum

Frequency Q
Avg. time for:
unit
Up to 20000 cfm
20000 to 75000 cfm
Over 75000 cfm

CHECK POINTS:
1. Secure all fans, sprays, etc.
2. Remove filters. (Except oil bath)
3. Vacuum all dirt from filter, frame, structure, and related parts.
4. Check if there is any way air can by-pass filter. Correct or report findings.
5. Replace filters. (Except oil bath)

CHECK POINTS: (continued)
6. Comply with lubrication schedule.
7. Observe operation of all units. Look for loose or worn belts, and observe any unusual noise, vibration, or odor.
8. Report any needed work you cannot do.

AIR WASHERS

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.

TOOLS:
Portable vacuum
Steam Hose
Service tools for pumps, fans, sprays, etc. Lubricants and lube equipment.

Frequency A
Avg. time for unit:
Up to 20000 cfm
20000 to 75000 cfm
Over 75000 cfm

CHECK POINTS:
1. Examine all structural elements f.a. openings, louvers, screens, dampers, connecting linkages, filter frame, etc. Look for corrosion, rust, deterioration, damage, etc. Clean and flush pans.
2. Remove filter and vacuum dirt. Look for places where air could by-pass filter.
3. Remove dirt from fins of coils. Check for leaks in coils and/or fittings.
4. Check eliminators and clean them.
5. Check controls especially those protecting against freezing.
6. Go over spray system, pump, piping,

CHECK POINTS: (continued)
spray heads. Make up water line and valves, over-flow, drains, etc.
7. Check fan, bearings, belts.
8. Examine motor(s), starter, push button, etc. Check contacts, brushes, etc.
9. Comply with lubrication schedule.
10. Wire brush and clean where required. Touch-up or repaint as needed.
11. Replace filter(s).
12. Report any work that is needed.
13. Nos. 2 and 11 do not apply to roll type filter.

C-1 CHECK VALVES

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

Frequency A
Avg. time for:
Up to 2"
2½ to 4"
4 to 6"
Over 6"

SAFETY:
See Crafts Handbook, chapt. 3.
Review applicable manufacturer's instructions.

TOOLS:
Spare parts
Gaskets

CHECK POINTS:
1. Determine if check is operating and holding while valve is in service. Small size valves should be replaced with a new or rebuilt one but large valves may be worked on in the line.
2. For large valves: Remove cover and clean. Determine fault. Replace flapper, swing, pin, etc., as needed. Inspect seat and grind in as required. Replace gasket and cover.

C-1 CHECK VALVES

C-3 COILS, HEATING, FOR H.W. TANK, ECONOMIZER, ETC.

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

Frequency 3 years
(Same as H.W. Tank)

SAFETY:
See Crafts Handbook, chapt. 3.
Review manufacturer's literature.

TOOLS:
Standard
Tank cleaning tools
Trash can(s)

CHECK POINTS:
1. While tank is open for cleaning, inspection, tests, etc., examine coils for rust, pitting, corrosion, etc.
2. Clean thoroughly.
3. Test coils. Repair leaks (if any).
4. Replace steam traps that are blowing through or faulty.

C-3 COILS, HEATING, FOR H.W. TANK, ECONOMIZER, ETC.

Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

C-4 COILS, PREHEAT, REHEAT, ETC. (REMOTE LOCATIONS)

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt 4.
Review applicable manufacturer's literature.

TOOLS:
Portable vacuum
Steam or air hose
Cleaning equipment

CHECK POINTS:
1. Vacuum or blow out the fins, coils, etc.
2. Remove obstructions to air flow.
3. Check coils. Correct or report any leaks.
4. Test and inspect controls that protect against freezing.

Frequency A
Avg. time for coils
Up to 20 sq.ft surface area
20 to 50
50 to 100
Over 100

NOTE:
This card applies to coils that are not part of an air washer or air handling unit.

C-4 COILS, PREHEAT, REHEAT, ETC. (REMOTE LOCATIONS)

C-6 CONTROLS (HEATING AND AIRCONDITIONING)
CENTRAL SYSTEM
GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.
Review applicable manufacturer's instructions.

TOOLS:
Test kit
Manufacturer's literature

CHECK POINTS:

Observe operation of control system to discover weaknesses or need for attention. Read and understand instructions before making adjustments or calibrations.
1. Check all air distribution lines. Stop all leaks.
2. Check compressed air PRV for correct pressure.
3. Check operation of thermostats, and humidistats for accuracy (use test kit). Adjust or calibrate as required.

Frequency A
Avg. time required for:
Auto control switch
Differential controller
Freezestat
Humidistat
Modutrol motor
Motorized damper, louver
Pneumatic relay
Thermostat
Control panel

CHECK POINTS: (continued)
4. Test bellows and diaphrams of controlled elements (valves, damper motors, etc.). Replace defective units.
5. Valves controlling flow to preheat, reheat, chilled water coils, etc., should operate without binding and close tightly adjust if necessary.
6. Lubricate packed-type valves (use oil and graphite unless manufacturer specifies something else).

(continued)

CHECK POINTS: (continued)

7. Relays, pilot valves, pressure regulators. Do they operate properly? Adjust as required. Use test kit and manufacturer's instructions.
8. Electric pneumatic and pneumatic electric control units. Stop leaks, adjust for proper closing tighten loose connections. Operate to show continuity and proper functioning.
9. Motorized valves, dampers, linkage, etc. Check freedom of motion position of limit stops, excessive play. Lubricate as prescribed.
10. Impose simulated conditions to activate controls and check operation.
11. Replace burnt out indicator lamps, bulls-eye, etc.

NOTE: Do not attempt to rebuild control units in place. Replace with a new or rebuilt unit and take to shop.

C-6 CONTROLS, (HEATING AND AIRCONDITIONING) CENTRAL SYSTEM

C-8 CONTROLS, REFRIGERATING MACHINE ROOM

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
Secure, valve off, or disconnect as applicable.

TOOLS:
Circuit analyzer
Replacement parts
Portable vacuum

CHECK POINTS:

1. Clean, vacuum or blow out, remove obstructions.
2. Test continuity and operation.
3. Replace any worn, pitted or defective parts.
4. Calibrate, adjust, or set.
5. Test by imposing appropriate signal and observing response or result. Replace any indicator lamps, bulls-eyes, etc.
6. Report need for any other work.

Frequency A
Avg. time required for each unit:
Electric interlocks
Electric relays
Solenoid
Pressure switches
Thermostatic element
Thermostatic switch
Oil pressure cut-off and alarm
Vaporstat
Pressure and vacuum gages
Control panel

C-9 COOLING TOWER

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt 4.
Review manufacturer's instructions.

TOOLS:
Cleaning materials, lubricants, and standard tools.

Frequency A
Time required _____
Up to 50 ton
50 to 100 ton
100 to 500 ton
500 to 1000 ton
Over 1000 ton

CHECK POINTS:
(Before seasonal start-up)
1. Remove dirt, trash, algae from water pans - flush.
2. Paint water pans if needed.
3. Check water outlets.
4. Check fan, bearings, belts, pumps, etc.
5. Check gear box. Add or change oil if needed.
6. Check drive shafts.
7. Check control and float valves.
8. Check screens.
9. Check water treatment equipment.

CHECK POINTS: (continued)
10. Check motor and starters, belts, etc.
11. Check structural fittings.
12. Continuous bleed line should be open.
13. Drain, flush out thoroughly.
14. Clean chemically, using approved materials, and neutralize.
15. Comply with lubrication schedule.

NOTE:
Drain water from all lines prior to freezing weather.

C-9 COOLING TOWER

E-18 EXPANSION JOINTS IN PIPING

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapts. 3 and 4.

TOOLS:
Packing
Packing tools and lubricant.

Frequency A
Avg. time for:
1-3" diam.
4-6" diam.
Over 6" diam.

CHECK POINTS:
BELLOWS TYPE JOINT
1. Replace when a leak occurs.
2. When possible repair bellows by welding.
SLIP-TYPE JOINT-WITH PACKING-GLAND
1. Examine joint closely, look for evidence of displacement, loose or defective anchors or bolts, alignment of joint with piping, guide rods, etc. Correct what can be done with pressure on report remaining items.
2. Observe packing gland, adjust to stop weeping or leaks.

CHECK POINTS: (continued)
SLIP-TYPE JOINT-WITH PACKING-GLAND
3. Renew packing completely when system is down for other reasons such as repair, overhaul, or maintenance of other components.
GUN-PACKED TYPE
1. Perform work prescribed in (1) and (2) for slip-type joint with gland.
2. Add packing if needed.

E-18 EXPANSION JOINTS IN PIPING

Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

F-1 FAN, CENTRIFUGAL

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.

TOOLS:
Wire brushes, scrapers, lubricant and lube portable vacuum equipment.

CHECK POINTS:
1. Check over unit thoroughly. Look for signs of rust, corrosion, or deterioration. Inspect interior of housing if there are openings to do so.
2. Check insulation, repair if needed.
3. Check structural members, vibration, eliminators and flexible connections.
4. Check bearings, shaft, pulley, and alignment with motor (if vibration is excessive check balance of rotor).
5. Comply with lubrication schedule.
6. Check belts, adjust tension or replace as required.

Frequency A
Avg. time for fan
Up to 1500 cfm
1500 to 5000 cfm
5000 to 10000 cfm
Over 10000 cfm

CHECK POINTS: (continued)
7. Check motor, controls, starter, etc. Observe bearings. Look for excessive clearance, unusual vibration, noise, odor, etc.
8. Blow out or vacuum windings, if necessary.
9. Clean complete unit. Touch up or paint as required

NOTE: This card applies to fans that are not a part of a unit.

F-1 FAN, CENTRIFUGAL

F-6 FILTER, ROLL TYPE DISPOSABLE MEDIA, MANUAL OR MOTOR DRIVEN

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt 4.
Review manufacturer's instructions.
Secure unit and fans and tag switches.

TOOLS:
Lubricants and lube equipment
Powdered graphite in puff-box
Draft gauge

CHECK POINTS:
1. Check over framework and structure. Look for loose or missing bolts, places air can leak by, condition of flashing or caulking, etc.
2. Check all moving parts for proper alignment, freedom of motion, excessive clearance or play, etc.
3. Check head or powered roll, tail or take-up roll, correct tracking of media, etc. On manual operation check wheel or hand crank.

Frequency SA
Or when roll is being changed.
Avg. time per unit:

CHECK POINTS: (continued)
4. On motor drives, check pressure sensing device(s) and/or pressure switches. Test settings for starting and stopping motor.
5. Check out motor, starter, controls, selector switch for auto. warning or indicator lights, etc.
6. Check oil in gear case. Change or replenish as required. Comply with lubrication schedule. Use graphite where it is suitable.
7. Replace filter media when roll is used up. Follow manufacturer's instructions.

F-6 FILTER, ROLL TYPE WITH DISPOSABLE MEDIA, MANUAL OR MOTOR DRIVEN

Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

H-1 HOT WATER GENERATORS

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 3.

Frequency 3 years
Time required _____

TOOLS:
Standard

CHECK POINTS:
1. From operating experience, performance of controls, drains. Condition of insulation, etc., are known.
2. Drain and flush tank (for ferrous tanks).
3. Remove built-up rust, scale, etc.
4. Scrape or wire brush to clean metal.
5. Test for tightness.
6. Apply coating (use approved materials).
7. Replace any damaged or missing insulation.
8. Paint or touch-up as required.
9. Relabel if needed.

G-1 HOT WATER GENERATORS

P-4 PUMP, CENTRIFUGAL - NOT INTEGRAL WITH MOTOR

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.

Frequency A
Time required _____

With motor	Up to 7½ HP
With motor	10 to 20 HP
With motor	25 to 50 HP
With motor	Over 50 HP

TOOLS:
Seals
Grease
Oil
Packing
Packing tools

CHECK POINTS:
1. Examine seal or packing, replace seal or repack pump if necessary.
2. Adjust the packing gland for drip from water seal. If a grease seal check grease cup for grease pressure.
3. Clean and lubricate coupling and bearings on pump.

CHECK POINTS: (continued)
4. Check motor and controls, starter, push button, etc.
5. Clean exterior of pump coupling, shaft and motor.
6. Check pump operation. If pump discharges through a check valve, test if check holds. If not replace check valve.

P-4 PUMP, CENTRIFUGAL - NOT INTEGRAL WITH MOTOR

Approved For Release 2001/07/12 : CIA-RDP78-05732A000100050001-9

R-2 REFRIGERATION MACHINE, ABSORBTION TYPE

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

Frequency Q
Avg. time for unit:
Up to 40 tons
40 to 100 tons
100 to 400 tons
Over 400 tons

SAFETY:
Review manufacturer's instructions.

TOOLS:
Standard

CHECK POINTS:
Purge System
1. Check sight glass. Change filter if required.
2. Time air bleed.
3. Check high level cut-out.
4. Inspect probes.
5. General
Add octyl alcohol to solution.

R-2 REFRIGERATION MACHINE, ABSORBTION TYPE

R-3 REFRIGERATION MACHINE, ABSORBTION TYPE Page 1 of 2

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

Frequency A
Avg. time for unit:
Up to 40 tons
40 to 100 tons
100 to 400 tons
Over 400 tons

SAFETY:
Review manufacturer's instructions.

TOOLS:

CHECK POINTS:
Evaporator Circuit
1. Check and service evaporator pump, motor, controls, starters, etc. Lubricate as prescribed.
2. Clean and flush out the seal, water tank, seal chamber, and associated lines.
3. Check purge valve diaphragm. Replace if necessary.
4. Inspect ball in check valve.
5. Inspect and clean evaporator, spray, header, nozzles, etc. Replace defective units.
Solution Circuit
6. Check and service solution pump, motor, controls, starters, etc. Lubricate as prescribed.

CHECK POINTS: (continued)
7. Check absorber reflex and generator, bulls-eye sight glasses. Replace if required.
8. Check purge valve diaphragm. Replace if required.
9. Inspect and clean solution spray nozzles. Replace defective ones.
Condenser Circuit
10. Clean the absorber and condenser tubes.
Purge System
11. Clean purge tank and purge with water. follow steps prescribed by manufacturer.
(continued)

CHECK POINTS: (continued)

12. Check adjustment of pressurentrol.
13. Adjust the restrictor.
14. Adjust high level cut-out.
15. Adjust automatic purge valve. Follow steps prescribed by manufacturer.
16. Check electric probe level adjustment.
17. Check sight glass. Replace filter if required.
18. Time air bleed.
19. Add octyl alcohol to solution.

Control System

20. Check capacity oontrol valve, linkage and stem, comply with librication schedule.
21. Replace signal lamps.
22. Check interlocks.

General

23. Check seals on solution pumps and evaporator pump. Replace if required.

R-3 REFRIGERATION MACHINE, ABSORBTION TYPE

T-8 TRAPS, STEAM, BUCKET, FLOAT, LIFT, THERMOSTATIC

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapts. 3 and 4.

Frequency A
Avg. time

TOOLS:
Asbestos or leather-faced gloves
Pipe wrenches
Spare traps
Nipples
Strainers
Chalk

CHECK POINTS:

1. Determine if trap is operating properly while it is in the line.
2. Remove faulty trap from line and replace with a new or rebuilt one.
3. While trap is out, examine strainer, blow down valve, nipples, etc. Replace any found defective.
4. Label all faulty traps "F.T." with chalk and return them to shop.

CHECK POINTS: (continued)

5. Rebuild or repair at bench.
   a. Disassemble
   b. Examine all working parts giving close attention to valve and seat.
   c. Replace all defective parts.
   d. Reassemble and test.
   e. Mark serviceable units OK and put in cupboard stock.

V-6 VALVES, MOTOR OPERATED

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 3.

Frequency A
Time per unit _____

TOOLS:
Powdered graphite in puff box
Cleaning equipment

CHECK POINTS:
1. Wire off unit and make visual examination of all parts.
2. Operate from limit to limit. Observe operation, look for binding, sluggishness, action of limits, etc.
3. Determine if valve seats and holds properly
4. Apply graphite to moving parts of valve.

CHECK POINTS: (continued)
5. Check lubrication schedule of motor and gear box.
6. Check contacts, brushes, etc., and motor, controls, switches, etc.
7. Correct any deficiencies. Report any needed work that you do not do.

V-6 VALVES, MOTOR OPERATED

V-7 VALVE, SAFETY OR RELIEF

GSA-PBS OFFICE OF BUILDINGS MANAGEMENT
PREVENTIVE MAINTENANCE GUIDE

SAFETY:
See Crafts Handbook, chapt. 4.

Frequency A
Avg. time for
Up to 2" diam.
2 to 4"
Over 4"

TOOLS:
ASME construction code
Boiler room tools

CHECK POINTS:
1. While boiler or tank is being serviced, examine valve for leaks, evidence of wear, wire drawing, corrosion, or other deficiencies.
2. Test action by raising pressure. NOTE popping pressure and reseating pressure. Record these values.

Guide No.	Item	Frequency Per Year	Hours
A-3	Air Circuit Breaker		
	Low Voltage	1/2	1.00
	High Voltage	1	2.00
A-4	Air Compressor		
	1 hp. and under	1	.75
	1 to 20 hp.	1	1.75
	Over 20 hp.	1	2.00
A-6	A/C Machine-Pkge Unit		
	7-1/2 Ton & Under	1	8.75
	10 to 15 Ton	1	9.25
	Over 15 Ton	1	10.00
A-8	A/C Window Unit	1	1.00
A-9	Air Cooled Condenser		
	10 Ton & Under	1	.75
	10 to 30 Ton	1	1.00
	Over 30 Ton	1	1.75
A-11	Air Handler Unit		
	Up to 5000 c.f.m.	1	1.50
	5000 to 15,000 c.f.m.	1	2.75
	Over 15,000 c.f.m.	1	4.75
A-12	Ceiling Diffusers	1	.35
A-14	Air Washer		
	Up to 20,000 c.f.m.	1	4.50
	20,000 to 75,000 c.f.m.	1	8.00
	Over 75,000 c.f.m.	1	9.00
A-15	Alarms	4	.25
B-1	Battery Charger	12	.25

Guide No.	Item	Frequency Per Year	Hours
B-2	Boiler, Cast Iron or Steel		
	Coal Fired	1	Group Time
	Oil Fired	1	Group Time
	Gas Fired	1	Group Time
C-2	Central Clock Systems	2	7.25
C-4	Coils, Preheat, Reheat (Remote)		
	Up to 20 sq. ft. Surface	1	.50
	20 to 50 sq. ft. Surface	1	.75
	50 to 100 sq. ft. Surface	1	1.00
	Over 100 sq. ft. Surface	1	1.75
C-9	Cooling Tower		
	Up to 50 Ton	1	7.00
	50 to 500 Ton	1	14.50
	500 to 1,000 Ton	1	29.00
	Over 1,000 Ton	1	38.50
D-1	Door, Power Operated	2	1.25
D-2	Dumbwaiter	4	3.75
D-3	Drains, Areaway, Driveway	2	.50
D-4	Drains, Roof, Gutter (per 100'), Etc.	1	.50
E-1	Electric Panels (Power-Lighting)	1/2	.50
E-3	Electrostatic Filter	26	2.50
E-9	Elevator, Hydraulic	12	5.75
E-10	Elevator, Hydraulic	1	15.25
E-11	Emergency Generator	Local Requirements	1.75
E-12	Emergency Generator	1	3.75
E-15	Escalator	12	1.00

Guide No.	Item	Frequency Per Year	Hours
E-16	Escalator	1	96.00
E-17	Evaporative Condenser		
	Up to 50 Ton	1	7.50
	Over 50 Ton	1	11.75
E-18	Expansion Joints in Piping	1	1.25
F-1	Fan, Centrifugal		
	Up to 1,500 c.f.m.	1	1.00
	1,500 to 5,000 c.f.m.	1	1.50
	5,000 to 10,000 c.f.m.	1	2.00
	Over 10,000 c.f.m.	1	2.75
F-3	Fans, Propeller		
	Over 24" Diameter	1	.75
F-5	Filter, Moveable Curtain, Oil Coated		1.75
F-6	Filter, Roll Type	As Required	1.75
F-6A	Filter, Throw-Away	As Required	.04
F-7	Filter, Viscous Type	As Required	.50
F-16	Special Lighting	1	.50
I-1;C-3	Hot Water Generator	1/3	4.50
G-2	Grease Traps	12	.75
I-2	Induction Unit (Under Window Type)		
	Fan Coil Units (Under Window Type)	2	.75
	Low Pressure	1	.75
	High Pressure	4	.50
M-3	Motor Generators Sets	1	2.50
O-2	Oil Circuit Breakers	1	4.25
P-6	Pumps, (Not part of system)	1	1.75

Guide No.	Item	Frequency Per Year	Hours
R-1	Radiators, Heating	1/5	.15
R-3	Refrigeration Machine, Absorption Type		
	Up to 40 Ton	1	15.25
	40 to 100 Ton	1	19.25
	100 to 400 Ton	1	23.00
	Over 400 Ton	1	30.75
R-5	Refrigeration Machine, Centrifugal Compressor		
	Up to 100 Ton	1	23.00
	100 to 500 Ton	1	38.50
	500 to 1,000 Ton	1	48.00
	Over 1,000 Ton	1	79.75
R-7	Refrigeration Machine, Reciprocating Compressor		
	Up to 40 Ton	1	23,00
	40 to 100 Ton	1	30.75
	100 to 500 Ton	1	38.50
	Over 500 Ton	1	79.75
S-2	Sewage Ejector	1	2.50
S-3	Sidewalk Elevator	12	3.75
S-7	Sump Pumps	1	3.75
S-9	Switch Boards, Electric		
	Open Front	1	2.50
	Dead Front	1/2	2.50
S-10	Switchgear, Electric	1	5.75
T-1	Tanks, Boiler Room	1	9.50
T-2	Tanks, Water Storage	1/3	6.25
T-3	Toilet Rooms	1	.03/Fixture

Appendix F

Guide No.	Item	Frequency Per Year	Hours
T-6	Transformer, Synthetic Oil-Filled	1/2	2.00
T-8	Traps, Steam		
	High Pressure	1	.50
	Low Pressure	1/5	.50
U-1	Unit Heaters	1	1.00
V-1	Vacuum Producer	1	3.00
V-2	Vacuum Pump Unit	1	7.75
V-5	Valve, Manually Operated		
	Main Line or Critical	1	1.00
	Other Over 2"	1/5	.50
V-6	Valves, Motor Operated	1	1.50
E-4	Elevator, Electric	6	1.50
E-5	Elevator, Electric	12	4.00
E-6	Elevator, Electric	4	5.50
E-7	Elevator, Electric	2	11.50
E-8	Elevator, Electric	1	15.25
EA-1	Elevator, Electric	1 (1st Month)	17.75
EA-2	Elevator, Electric	1 (2nd Month)	17.75
EA-3	Elevator, Electric	1 (3rd Month)	17.75
EA-4	Elevator, Electric	1 (4th Month)	17.75
EA-5	Elevator, Electric	1 (5th Month)	17.75
EA-6	Elevator, Electric	1 (6th Month)	17.75

Guide No.	Items	Frequency Per Year	Hours
EA-7	Elevator, Electric	(7th mo.)	17.75
EA-8	Elevator, Electric	(8th mo.)	17.75
EA-9	Elevator, Electric	(9th mo.)	17.75
EA-10	Elevator, Electric	(10th mo.)	17.75
EA-11	Elevator, Electric	(11th mo.)	17.75
EA-12	Elevator, Electric	(12th mo.)	17.75
A-1	Acid Pits	1	Group Time
A-2	Adjustable Loading Ramp	4	1.25
A-16	Ash Handling Equipment	1	Group Time
C-6	Central Control System	1	Group Time
E-13	Entrance Doors	2	1.00
F-20	Fuel Oil Storage Tanks	1	Group Time
I-1	Incinerator	1	15.25
M-1	Manhole, Electrical	1	2.00
M-2	Manhole, Sewer	1	2.00
O-3	Outside Lighting Systems	1	Group Time
P-1	Paper Baler	1	Group Time
P-2	Pneumatic Tube System	2	Group Time

Appendix F

Guide No.	Items	Frequency Per Year	Hours
S-8	Surface Water Pits - Settling Pits	1	Group Time
T-5	Transformer, (Oil Filled)	1	Group Time
T-9	Turbine	1	11.50
W-3	Water Softener	As Required	Group Time
W-5	Window Washing Scaffold, Power Operated	1	Group Time

* F-8 thru F-15 to be added at a later date.

SECTION 2

APPENDIX H

M - 1	Roof Plan
M - 2	Equipment Room - Upper Level
M - 3	Equipment Room - Lower Level
E - 1	Single Line Diagram